



## Emerging Roles of U.S. Pharmacists in Global Health and Africa

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### Abstract

The transition from 20<sup>th</sup> to 21<sup>st</sup> century involved increasing global perspective to health and disease. Africa has reportedly accounted for 13% of the world's population, 24% of the world's disease and yet 3% of the world's healthcare workforce; an imbalance creating vulnerability ranging from health disparities to terrorism. The public health system in Sub-Saharan Africa has been a significant focus of global health intervention, especially in tackling HIV/AIDS, Tuberculosis and Malaria. The United States' role has also increased for both humanitarian and security-related strategic interests. The purpose was primarily to explore and identify examples of key pharmaceutical-related public health problems in Africa, United States (U.S.) pharmacist and pharmacy school involvement in Africa; and secondly, to introduce and evaluate student interest in global health pharmaceutical issues, activities and potential careers. Access, affordability and safety of pharmaceuticals are among those important global health areas of interest; others are healthcare worker shortages, financial resource and allocation problems and challenges with indigenous health system leadership. The World Health Organization (WHO) estimates indicate marked imbalances or insufficiency in global workforce distribution, especially in Sub-Saharan Africa to tackle such problems. An overview of the literature and collaborative partnerships between U.S. and African Colleges of Pharmacy, and the incorporation of global health policy into pharmacy curricula illustrate examples of higher education contributing to shaping future health professional roles and career interests for new and expanding service opportunities in the global health workforce.

**Keywords:** Africa; Global health; U.S.A pharmacist; Pharmacy education; Medicines

### Introduction

The World Health Organization (WHO) is the public health arm of the United Nations as its directing and coordinating authority for health. It monitors disease outbreaks, assesses global health system performance, provides leadership on global health matters and shapes the health research agenda [1]. WHO defines health as the state of complete physical, mental and social wellbeing, and not merely the absence of disease or infirmity [2]. Public health has been defined as the organized community efforts to protect, promote, improve or restore the community's or population's health [3,4].

Health promotion and disease prevention technologies and interventions encompass core functions of public health at the international level, including: assessing and monitoring at risk populations to identify health problems and priorities; formulating global public policies in collaboration with community and government leaders and ensuring that people have access to appropriate and cost effective care [3,5].

Globalization has increased the awareness of global health disparities, helped to decrease global disease burden and increased global health education demand, often addressed by academic global health programs of high income nations in low to middle income nations [6,7]. Shaping global health landscape and policy typically involves balancing public health priorities with commercial or corporate interests, and often requires government intervention, even balancing such interests amongst several governments worldwide.

One core aspect of global health policy pertains to pharmaceuticals, as medications are a key treatment modality for controlling many diseases. Providing access to affordable medications collaboratively with the pharmaceutical industry is one target outcome of WHO's health-related millennium development goals (MDG) targeted for 2015. [8].

WHO has also promoted national pharmaceutical policies to ensure access, affordability, quality and rational use of medications and introduced the concept of the essential drug list. In recent years, there has been focus on 1) access to medications in developing nations, 2) lack of resources for research and development (R&D) on tropical and neglected diseases, and 3) intellectual property rights and link to medicine pricing [9].

Those problems of priority global and pharmaceutical health policies are often magnified on the African continent, with its majority of developing nations. The U.S. has played a key role in supporting the improvement of the public healthcare systems in Sub-Saharan African countries. This has been achieved for example through different current and former presidential responses, such as President's (Bush) Emergency Plan for AIDS Relief (PEPFAR), malaria initiatives or Clinton's Global initiative promoting medicine accessibility and affordability. These are among the issues that future health professionals should gain understanding of in their training on global health issues and policy.

There is renewed interest in global pharmacy education among U.S. Colleges/Schools of Pharmacy. Benefits include exposure of faculty and students to opportunities in global health research, developing

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pharmaceutical care models on cultural sensitivity and increased awareness of global health challenges and disparities [10]. Changes in curriculum, new teaching methods and innovative training models are necessary and important for the continuum of care and sustenance of the healthcare workforce in Africa [11].

The purpose was primarily to explore the literature and identify examples of key pharmaceutical problems in Africa, U.S. pharmacist and pharmacy school involvement in Africa; and secondly, to introduce and evaluate student interest in global pharmaceutical issues, activities and potential careers through an elective health policy elective course. A description of the literature search and introduction of one pharmacy school's health policy elective, an outline of increasing U.S. engagement in Africa, examples of U.S. and African Pharmacy School and College collaboration, examples of pharmacist roles in public health and discussion of various public health and policy problems with suggested solutions for consideration are covered.

### USA and Africa, Global Health and Pharmacy Schools: Exploring Literature and Education

In exploring the primary literature for global health and collaborative relationships between U.S. Colleges and Schools of Pharmacy in Africa, articles were collated by performing searches of electronic databases and reference lists of relevant articles. Twenty papers that were both internationally and nationally peer and non-peer reviewed were identified. The database searches include MEDLINE, International Pharmaceutical abstracts (IPA) and PubMed.

The search terms used were “pharmacy and Africa”, “global health and pharmacy”, “healthy people 2020”, “UNAIDS and Pharmacy”, “pharmacist shortage in Africa”, “ U.S. Pharmacists in Africa” and “collaborative partnerships between U.S. Colleges of Pharmacy and Schools of Pharmacy in Africa”. Unpublished reports and presentations from the American Association of Colleges of Pharmacy (AACP) and College of Pharmacy website reviews on collaborative partnerships were also identified. Any collaborative programs which did not include pharmacists were excluded from the search.

Other search criteria excluded those which were university to university collaborative partnerships in any other discipline apart from pharmacy. Those partnerships between universities and medical centers and hospitals were also excluded. This search yielded results of eight collaborative programs between Colleges/Schools of Pharmacy in the U.S. with Schools of Pharmacy in Africa.

The main website utilized for finding the collaboration partnerships between universities related to pharmaceutical care was www.twinningagainstaids.org and the AACP website on presentations related to global pharmacy education. These collaborative partnerships

are outlined in Table 1: Academic refers to general didactic education to pharmacy students. Experiential education refers to clinical practice education to pharmacy students, which typically takes place at health institutions and health service delivery sites. Training refers to the continuing education and training of health professionals and faculty to build capacity for health management on the Continent.

Feedback from a student focus group was also gathered at a four-year, U.S. pharmacy school program introducing a new 3-credit hour health policy elective. An email was first sent out to second, third and fourth year professional students who had shown some interest in health-related legislative issues and were actively engaged in professional advocacy activities. Eight students serving as the focus group enrolled and participated in the course, which ran for 15 weeks, covering both U.S. national and global health policy.

Introductory global health policy topics in the elective course covered a review of health systems in some western nations such as Canada, Germany, United Kingdom, Japan and developed nations. Also covered were global pharmaceutical organizations and programs, such as Promoting the Quality of Medicines in developing countries (PQM), Strengthening Pharmaceutical Systems (SPS), U.S. Agency for International Development (USAID), U.S. Africom, Red Cross, President's Emergency Plan for AIDS Relief (PEPFAR), medical missions, essential drugs, WHO's MDG, social determinants of health policy and the role of ethics and leadership in global health.

U.S. policy goals for diplomacy, development and defense through health expansion in its relations with the Africa were also covered. Students were given reading materials for team-based and virtual discussion, such as the leadership of Nigeria's Dr. Dora Akunyili in her crusade against counterfeit medications [8], and the Howard University PACE Center in Nigeria as an academic global health program example [12,13].

These introductory concepts on advocacy, health policy and global health were creatively introduced to students in the elective using innovative technology-based teaching methods, such as 1) Blackboard-based virtual classroom and 2) topic discussion threads, 3) virtual team-based interactive lecture with self-reflective questions on global health, 4) daily Google e-mail alerts pertaining to pharmacy-related health policy topics of interest and 5) Drop-box-based virtual portfolio for posting of assignments and legislative position statements [14].

Students enrolled in the course expressed very positive feedback of the learning experiences and global health career interests in several areas, especially pharmaceutical industry, tackling counterfeit medications and working for international organizations, such as WHO.

Types of partnerships	US College of Pharmacy	African counterpart
Training	University of Washington	Jimma University, Ethiopia
	Howard University	Addis Ababa University, Addis Ababa Ethiopia
Academic	Howard University	University of Pretoria, Pretoria, South Africa
		University of Ghana, Accra, Ghana
Training and experiential education	University of Alabama	University of Zambia
	McWhorter School of Pharmacy, Samford University	University of Zambia
	University of California, San Francisco	University of Zambia
Experiential education	Purdue University	Moi University, Eldoret, Kenya
	Drake University College of Pharmacy & Health Sciences	Tanzania
		University of Kwazulu Natal, Durban, South Africa

Table 1: Examples of collaborative U.S. and Africa Pharmacy program initiatives.

## Discussion

This paper highlights pharmaceutical-related health issues pertaining to Africa, as this is a significant subject to public health and growing U.S. and global policy interests. Global health programs, public health and education activities, problems and possible solutions are introduced. U.S. relations with Africa have evolved over the past half-century to increased engagement as a strategic interest. Addressing healthcare in Africa has become a part of wider global security issues, which includes humanitarianism and infrastructure development to indirectly combat terrorism.

The history and future of U.S. and Africa, relations can be broadly outlined in four stages: 1) Limiting Soviet expansion during the Cold War, 2) 1990s Disengagement post-Cold War and advent of African insurgency/civil war, 3) Post 9/11 and the end of disengagement, and 4) Bringing enduring stability to Africa, as U.S. strategic interest to combat and prevent remote or ungoverned areas from becoming havens for terrorism [15].

The latest phase includes the turn of the century to present. The first decade of the 21st century, especially has had the public health systems of Sub-Saharan Africa as a focal point of international intervention. Countries in the Sub-Saharan African region include: Botswana, Cameroon, Chad, Congo, Cote d'Ivoire, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe [16].

The HIV/AIDS pandemic in Africa led to aid from developed nations; particularly the U.S. UNAIDS and Global Fund to Fight AIDS, Tuberculosis (TB) and Malaria were also established through corporations, private foundations and religious organizations. These entities have brought more awareness of Africa's public health system inadequacies to the attention of foreign policy experts and other organizations and groups.

Another group devoted to strengthening the public health system in developing countries of the Sub-Saharan African region is the Global AIDS Alliance [17]. This organization includes Physicians for Human Rights, Action Aid USA, American Medical Student Association, Global Health Council, Health GAP, Health System Action Network, Oxfam International and University Coalition for Global Health. They recognized the difficulty in improving the public health system due to the fact that the differential income of healthcare providers has caused many to migrate to nations where they can earn more money and improve their quality of life.

The United States, led by the President George W. Bush's "President's Emergency Plan for AIDS Relief (PEPFAR), announced in January 2003, anchored the charge and fight to combat HIV/AIDS in Africa [18]. According to an article published in the *Annals of Internal Medicine*, about 1.2 million deaths were avoided due to PEPFAR's activities [19]. The impact of this program also encouraged involvement in other public health problems in Africa, such as the President's Malaria Initiative.

President Barack Obama's administration was involved in establishing a new initiative to PEPFAR activity by adding tuberculosis and malaria to its agenda with increased funding. In 2004, reported average African life expectancy was 47 years and the greatest percent of death resulted from acute infectious diseases, such as malaria, TB, cholera, HIV and sexually transmitted disease [20]; although malaria

has been called "the forgotten epidemic" by Bill Gates, his foundation has given millions of dollars to malaria vaccine research [21].

Approximately, 300 to 500 million cases of malaria occur annually in Africa causing more than one million deaths [20]. Malaria occurs primarily in Sub-Saharan Africa with a higher mortality rate in children of developing countries due to global temperature rise. There is also a high prevalence of untreated sexually transmitted diseases (STD) infections, facilitating the spread of human immunodeficiency virus (HIV), with the synergistic interaction between HIV transmission and genital herpes influencing the control of both diseases [22].

Some of the preventative measures implemented by the Centers for Disease Control and Prevention (CDC) include high impact prevention measures like HIV testing and linkage to care; antiretroviral therapy; access to condoms and sterile syringes; prevention programs for people living in the U.S. with their partners; substance abuse treatment and lastly screening and treatment of other STDs (Centers for Disease Control and Prevention, 2011). Healthy People 2020 initiatives can be beneficial with pharmacist service implementation in global public health. However, more public health training is needed to equip pharmacists in Africa for this role.

Possible solutions to help in the improvement of the public health system of various African regions may include assistance and funding from wealthier countries, different private organizations and institutions, supporting programs that send healthcare professionals and students to help in the training of host countries' health care workers [8].

Wealthy countries may also help in renovating old medical facilities and providing new updated equipment. International organizations and other developed countries may also help politically in pushing the host nations to improve their healthcare system. This persuasion may be much easier if accompanied with financial support and assistance. Financial assistance, however, can meet considerable infrastructural challenges due to either mismanagement of funds, or a dependency and sense of entitlement to foreign aid. This has often contributed to poor decision-making, lack of transparency and accountability or commitment to its people by its leadership [8].

An additional focal problem that persists is the migration of healthcare workers to wealthier countries for better salaries and opportunities for exposure to more advanced medical facilities and equipment. Such problems in turn affect medications, health services and other resource access [8]. Overall, WHO [11] estimated a shortage of approximately 4.3 million healthcare workers. The healthcare professional shortage worldwide includes the pharmacy profession [23,24], with marked imbalances or insufficiency in global pharmacy workforce distribution arising primarily in Sub Saharan Africa [25].

There are about 57 countries falling below the WHO threshold of 25 healthcare professionals per 10,000 populations, which has a negative effect on health outcomes and hinder achieving WHO Millennium Development Goals (MDG) [11]. It is now widely accepted that the dire shortage of health workers in many places is among the most significant constraints to achieving the three health-related Millennium Development Goals: to reduce child mortality, improve maternal health and combat HIV/AIDS and other diseases, such as tuberculosis and malaria [11]. Of these, Sub Saharan countries make up the greatest proportion with critical shortage [11].

Figure 1 illustrates a comparison of pharmacist numbers per 1000 patients in the region, depicting the deficiency of pharmacists in

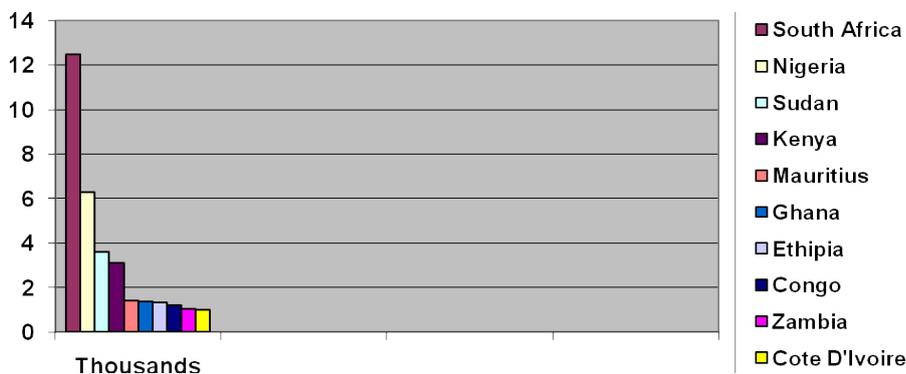


Figure 1: Numbers of the highest 10 pharmacist workers in Sub-Saharan African countries. Note: U.S. pharmacist workers: 259,642 (adapted from Mills, 2008).

Health indicator	Pharmacist program examples
Physical activity	Patient counseling
Overweight and obesity	Patient counseling, diabetes/lipid/etc clinics, cholesterol screenings, blood pressure screenings
Tobacco use	Smoking cessation programs
Substance abuse	Psychopharmacology consult/liaison, Medication therapy management (MTM)
Responsible sexual behavior	Patient counseling
Mental health	Psychopharmacology consults/liaison, MTM
Injury and violence	Patient counseling & supportive service referrals
Environmental quality	Patient counseling, smoking cessation programs
Immunization	Pharmacist-administered immunizations
Health care access	MTM, Free clinics, indigent drug programs, student clinics

Table 2: Healthy people 2020—Leading health indicators (adapted from U.S. DHHS 2010).

various regions in Africa and certainly do not meet the average number recommended by WHO.

### United States pharmacy and public health

A better understanding of the nuances of the role of pharmacists in the U.S. is outlined below. U.S pharmacists have provided patient medication counseling and teaching for many years. The offer to counsel was an important provision of the Omnibus Budget Reconciliation Act of 1990 (OBRA '90). It was mainly directed towards Medicaid patients, but many states extended it to every patient, including both new and refilled prescriptions [26].

Three main provisions included drug utilization review (DUR), patient counseling standards and maintaining patient records. Drug utilization review focuses on a retrospective review of prescribing and dispensing. This addresses the appropriateness of a medication regimen, its medical necessity and also minimizes adverse events [26]. Patient counseling includes provision of oral and written drug product information, such as common side effects, proper storage and administration, missed dose scheduling, intended use and lifestyle information for behavioral changes that enhance wellness [26].

Pharmacists collaboratively optimize medication use and provide health education seminars in the community. They also manage clinics for chronic diseases such as HIV, mental health disorders, hyperlipidemia, diabetes, anticoagulation and hypertension. Other services provided include immunizations, smoking cessation programs, prevention and wellness programs. Pharmacist-run clinics can facilitate improved patient adherence [27], targeted drug therapy monitoring and provide access to comprehensive medication therapy management (MTM) services.

Pharmacy practice roles in public health are illustrated with the national program Healthy People 2020, representing a systematic approach to improving health of individuals, communities and the nation. One key goal is increasing healthy life years and quality and eliminating health disparities. This is achievable by increasing patient knowledge, motivation and opportunities for informed health decisions. It is essential for community and leaders nationwide to promote healthy behaviors and environments and ensure there is adequate health care access [28].

Pharmacists participate in health fairs and perform blood pressure screening, blood glucose monitoring, memory screening, brown bag session counseling, etc. [28]. Table 2 lists Healthy People 2020 Leading Health Indicators, which are key focus areas that can be applied to promoting educational and manpower needs abroad. The American Public Health Association (APHA) released a policy statement on the role of the pharmacist in public health outlining similar roles to healthy people 2020 leading health indicators [29].

### Pharmacy, public health and Africa

Pharmacist distribution in public health is likely to be lower than the private sector [24]. Reasons for this uneven distribution include inadequate pharmacy student education about global public health and pharmacist migration from developing to developed countries [24]. Regions such as South Africa in the past decade graduated approximately 1000 pharmacists annually; they unfortunately trained many pharmacists who left for overseas [30].

Pharmacists in many African countries are few in number with limited training to handle the public health dilemma [25]. In developing countries, a pharmacist/population ratio of less than 1/100,000 is not uncommon as compared to 200/100,000 in developed countries [20].

Political and economic problems in various regions prompt health professionals like pharmacists to leave [30]. Additionally, areas with few pharmacy schools (e.g. Botswana, Cameroon) have invested in sending students abroad to study [30]. After qualification, they may choose not to return to their country.

Katerere and Matowe [30] also noted that, pharmacist shortage limited opportunities for consultation, while limited management skills affected budget control and rationalizing drug use. Still, many pharmacists felt that their skills were underutilized and they wanted to move towards more professionally challenging tasks [31]. Some believed they were poorly recognized or credited for what they did and patients looked only to physicians. There was also a lack of challenge for pharmacists when they solely dispensed medications [31].

African countries also experience educational challenges, such as need for qualified professors, updated physical infrastructure and equipment [32]. In March 2008, at the Global Health Workforce Alliance (GHWA), the International Pharmaceutical Federation (FIP) came out with Action plan 2008-2010 to approach pharmacy education development, build capacity and quality of pharmacy education worldwide; it was a joint initiative of WHO and United Nations Educational Scientific and Cultural Organization (UNESCO) [33].

Further research and review of strategies to build academic workforce capacity is warranted [33]. One key barrier to academic faculty workforce retention and quality needs-based education, particularly in developing countries, is lower salary and poor physical institutional infrastructure where basic facilities as well as learning and teaching resources may be insufficient or not even exist [33].

The U.S. comparatively has a large pharmacy workforce that can possibly assist developing nations [25] (Figure 1). Recently, increased U.S. involvement in promoting pharmacy education in Africa is proving to be beneficial. Collaborative partnerships have been formed between U.S. Colleges and Schools of Pharmacy to provide resources to schools of pharmacy in Africa to train their faculty and students to be better educators and clinicians, respectively, while reducing the need for migration to developed nations. Concerted efforts by the University of Washington and Howard University College of Pharmacy (HUCOP) in Ethiopia and Purdue University School of Pharmacy and Pharmaceutical Sciences (PUSOPPS) in Kenya are just some examples of U.S. Colleges of Pharmacy collaborating with non-profit organizations and the U.S. government to develop training, clinical and public health programs in Africa. Changes in the curriculum, new teaching methods and innovative training models are necessary and important for the continuum of care and sustenance of the healthcare workforce in Africa [20].

Some U.S. Pharmacy schools have taken the initiative to form collaborative partnerships that have provided critical manpower, training and resources. These partnerships have provided for opportunities for U.S. pharmacy students to interact with the host country's pharmacy or medical students in daily ward rounds in patient care settings, such as inpatient medicine, pediatric and mental health wards under supervision of U.S. pharmacy faculty and their African counterparts. Together they participate in drug information consultations, patient cases and topic discussions on tropical diseases and journal clubs focused on international and public health.

Howard faculty has been involved in traineeships at Addis Ababa University in the past few years. For example, Howard University's College of Pharmacy, (HUCOP) established a Drug Information Center in Ethiopia in collaboration with the American International Health

Alliance (AIHA) Twinning Project, through a grant from the CDC. Some of the work has involved training faculty members and graduate students in obtaining a Masters in clinical pharmacy across the seven pharmacy schools in the nation. Another goal is to provide resources to the faculty at all seven schools to promote sustainability and increase building capacity of the project [34].

At Purdue University School of Pharmacy and Pharmaceutical Sciences (PUSOPPS), pharmacy students have the opportunity to participate in an eight-week rotation in Kenya alongside the pharmacy students from the University of Nairobi. They provide services to HIV-infected patients with antiretroviral therapy and medications for opportunistic infections [35]. The U.S. students prepare for this rotation by taking classes on disease states, such as HIV, TB, malaria and reading materials about African culture. This partnership exposes American pharmacy students to global health issues, while exposing Kenyan pharmacy students to American pharmacy education [35].

This interaction is beneficial to both the American and African pharmacy students. American pharmacy students can discuss their experiences with colleagues, stirring more interest in global public health. African students can apply their learned skills in less fortunate regions. This opportunity was created by a grant from the U.S. Agency for International Development-Academic Model for Providing Access to Healthcare (USAID-AMPATH) [35].

Leaders of pharmacy from Ethiopia, Ghana, Kenya, Malawi, Tanzania, Uganda and Zambia met with the WHO, United Nations Educational, Scientific and Cultural Organization (UNESCO), and the International Pharmaceutical Federation (FIP) Pharmacy Education Taskforce to discuss the challenges of educating pharmacists in resource-limited settings in sub-Saharan Africa. Their challenge was getting qualified and experienced academics to fill teaching positions within institutions [32].

Collaboration with partnership organizations, placing a stronger emphasis on clinical training and engaging diaspora, alumni and stakeholders within the community and industry were some ways that these leaders felt would address their local challenges. One institution noted an expanded intake of pharmacy students and an increase in employment of pharmacists in private hospitals due to their background in clinical training. Educating the community and government about the role of pharmacists and establishing an African regional database of pharmacy courses was also an important issue of discussion [32].

### Pharmacists in global health

Improving healthcare in developing countries remains a priority for the global health community. The Medicines Control Council (MCC) of South Africa joined Pharmaceutical Inspection Co-operation Scheme (PIC/S) in July 2007, becoming the African continent's first PIC/S member. PIC/S is designed to assist national regulatory authorities (NRAs) in strengthening their inspectorates and regulatory standards. PIC/S member achieves their objective for inspecting quality systems and their good manufacturing practice (GMP) guidelines; promoting networking with regulatory authorities in differentiations develops mutual confidence, exchanging information and practical experience with GMP and related topics; mutually training inspectors and supporting GMP inspectors. As of February 2011, PIC/S had 39 participating authorities including Argentina, Australia, Canada, Israel, Malaysia, Singapore, South Africa and various European countries.

The U.S. Food and Drug Administration and the Ukrainian State Inspectorate for Quality Control of Medicines (SIQCM) were added in

January 2011. The first requisite for pharmacists in global health is to improve the availability of good quality medicines in Africa and the West Indies, and helping them to become PIC/S members.

Pharmacists in global organizations such as International Pharmaceutical Federation (FIP) facilitate and share efforts to maximize pharmacy education development, while stimulating international research to develop tools that will guide the understanding of key issues [36]. The global pharmacy education taskforce was created to leverage strategic leadership and maximize the impact of collective actions at global, regional and national levels [36].

Charitable organizations, like Doctors without Borders [37] and WHO have made an effort to provide healthcare support and services to countries in dire need [36]. Pharmacists have volunteered their time to provide services like drug administration and assist in negotiating for a consistent supply of imported medications for HIV and malaria treatment [36].

Some social norms, such as smoking, drinking, illicit drug use may increase health care costs, morbidity and mortality rates [38]. Healthy behavior decreases health care costs, decreases morbidity and mortality and improves the quality of life [38]. The greater the role of pharmacists in global health, the lower the financial burden, medication misuse and drug abuse in many African countries and the diaspora [39]. The code of ethics for pharmacists encompasses a public health perspective [40]. American Pharmacists Association, states that “a pharmacist should serve patients’ needs at the individual, community and societal levels”. These needs include preventing disease and promoting safe medication use in the community at large, as well as in society [41].

The population approach to helping people is exemplified by this quote from Dr George Benjamin, executive director of the American Public Health association. “When one person comes in with a rat bite, you take care of the bite”. When five people come in, you take care of the rats” [42,43].

### Considering solutions for healthcare, education and policy development

Africa has been reported to account for about 13% of the total human population and 24% of the world’s diseases. Again, the region of Africa most affected by this problem is the sub-Saharan Africa section [19]. Countries in this region receive an inadequate supply of medications for various medical conditions [19]. In other situations, there are a few qualified healthcare professionals who can assist in administering the medications correctly, as well as educating and counseling patients on preventative measures [36].

Still, there has been the longstanding battle to eradicate the distribution of fake, adulterated and substandard medications [8]. This can be attributed to the poor public health system in this region and limitations, or lack of credible leadership in government and private sectors to drive progress and growth. Oji and Oji [8] recommends a “tripod model” or three-legged objective of cure to leadership challenges and corruption: 1) Punishment of the offenders as a deterrent, 2) education and public reorientation to ethical values, 3) Constructive restitution by the corrupt leader offenders for the benefit of the general public and victims of the offender’s infraction.

Improving the public health system in this region would have to begin with establishing good strong and committed leadership in the host countries. The issue of host country’s healthcare workers leaving for greener pasture to foreign wealthier countries would also need to

be addressed by considering added incentives to stay. Health education and literacy initiatives could also improve care delivery for issues such as mental health and immunization. Host countries may benefit from the help of international organizations and wealthy countries for financial funding, accompanied with clear strategies to promote leadership accountability and discourage dependence.

Some basic building blocks for a better and more adequate public health system in Africa will need to involve public health research, information and surveillance [19]. This can be done by improving the research and surveillance done in Africa, so disease problems are determined appropriately, adequately recorded and interventions made available [19]. It is beneficial for a case to be properly recorded and made available to the appropriate department or division, like the department of health. More public health research in countries affected will also provide opportunities for hands on research, which may expedite the finalization of results [19].

Secondly, Africa encompasses 24% of the world’s disease burden; however, only 3% of the global healthcare workers, which include doctors, nurses, pharmacists, etc., are reportedly present in this region [17]. This is notable, since developing countries of which most are under poverty, cannot compete in providing competitive wages, sufficient or updated medical equipment [17]. Thirdly, it is imperative to promote affordable health services in hospitals, clinics, pharmacies etc., to the patients and consumers [43].

New sponsors from developed countries who are willing to invest in the development and improvement of this region’s health system would be totally instrumental to such efforts [43]. Fourthly, more private institutes like universities or international organizations can sponsor healthcare workers like physicians and pharmacists to go to countries that are lacking a healthcare system, to help in training the host country’s healthcare worker on advancement in the medical field [36].

The presence of pharmacists from wealthier countries, through the sponsorship of international organizations like WHO or Global Alliance, also play a significant role in helping to lobby for new medications and immunizations from foreign suppliers [36]. Fifth, governments and other organizations or entities of authority, power and/or influence may implement adequate policies that are effective in achieving this goal [19]. This leadership involves both the home country and foreign nations (particularly the U.S.) in helping shape this change [19]. Finally, initiatives to impact individual perceptions of various diseases can also enhance access to adequate care [8].

Examples of negative attitudes include discriminatory attitudes towards individuals with HIV/AIDS [44], health care system distrust that discourages local polio immunization [8], or the likely contribution of mental health stigma and poor compensation to the existence of just 100 psychiatrists to serve Nigeria’s population of 140 million [45].

Pharmacy education fosters the profession’s capacity to contribute to and meet society’s complex health workforce needs. Pharmacy schools are encouraged to pursue international collaboration, thereby improving pharmaceutical services on a macro or global health scale [46]. An appreciation for global health issues and regions of priority will guide higher educators and leaders in shaping the education of future professionals who will work effectively on interdisciplinary teams to promote optimal public health.

### Conclusion

There has been a continued increasing global perspective to

health and disease. The public health systems of Sub-Saharan African countries have been a significant focus of global health intervention, especially in the face of major issues that are amplified by epidemics, such as HIV/AIDS, Malaria and TB. The United States' role has also increased, as promoting a stable public health infrastructure is both organized humanitarian effort that improves population health and strategic interest that serves to minimize and abolish ungoverned pockets vulnerable to becoming havens for terrorist organizations like Al Qaeda.

Access, affordability and safety of pharmaceuticals are among those important global health areas of interest and are marked in the Sub-Saharan African region, as well as healthcare worker shortages, financial resource and allocation problems and challenges with indigenous health system leadership. The World Health Organization (WHO) estimates indicate marked imbalances or insufficiency in global workforce distribution, especially in Sub-Saharan Africa to tackle such problems. Nevertheless, pharmacist roles in public health, education and stimulating student interest and career paths can help contribute to global health workforce and interventions.

Review of the literature, global health education, U.S. and African Pharmacy School and College collaboration and pharmacist roles in public health, help to identify, raise awareness and understanding of the public health and policy problems. Reflection on the wide array of these problems and brainstorming on solutions contributes to new and expanding higher education, health service opportunities and policy development. U.S. pharmacist academic and professional workforce represents a strength that has and should continue to be applied towards solutions for public health on the African continent and U.S. strategic interests.

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