

Science, Technology and Healthcare Delivery in Ghana: A Historical Perspective

Tudomány, technológia és egészségügyi ellátás Ghánában: Történelmi perspektíva

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Initially submitted March. 18, 2019; accepted for publication Apr. 20, 2019

Abstract

In the last three decades, a number of studies have been undertaken concerning the impact of science and technological innovations on health sector reforms and responsive healthcare delivery in most countries globally. However, few of these studies are placed in historical context and/or focused particularly on the case of Ghana. In addition, such studies are mostly carried out in the biomedical and physical sciences with very few in the social sciences. Against this background, this paper draws experiences from health professionals in purposively selected institutions in Ghana and supported with critical review of related literature, to answer two central research questions. First, how has science and technological advancement effectively and efficiently supported healthcare delivery system in Ghana? Second, how have post-independence health sector reforms in Ghana been responsive to the needs of patients due to advances in science and technology? Based on empirical results, we argue in this paper that over the last few decades, advances in science and technology have significantly improved Ghana's health delivery system and promoted responsive healthcare particularly in the area of orthodox medical services. However, the gains from advances in science and technology need to be strengthened by the Ministry of Health, Ghana Health Services and relevant stakeholders to improve health facilities and conditions especially in rural districts in the country.

Keywords: Technological Advancement; Science; Health Sector Reforms; Healthcare Delivery; Ghana

Kulcsszavak: Technológiai fejlődés; Tudomány; Egészségügyi reformok; Egészségügyi ellátás; Ghána

1.0 Introduction

Science and technological innovations are the main driving tools for the advancement of the world. Several scientists have emerged to improve the standard of living among humanity through scientific experiments and ideas. It is based on the ever-changing nature of this phenomenon that has enabled humanity to adapt to the ever-demanding nature of society. Through science and technology, most societies are able to solve problems and live in good health. Healthcare delivery is an important sector that demands the necessary scientific improvements to ensure quality living among people. Science and Technology are the cockpit of world development; it undergirds economic advances, education, infrastructure and improvements in health systems.¹

Innovation is surrounding us; we live in a world in which everything that exists can be named as work of nature or work of man. Through time, innovation is getting speedier, better and littler. In this manner, organizing and reprioritizing standards to work as an inseparable unit with healthcare practice and

¹ Chetty Lee-Roy, "The Role of Science and Technology in The Developing World in the 21st Century" Accessed on 1st June, 2018

<https://ieet.org/index.php/IEET2/more/chetty20121003>

mechanical advancements is necessary.² Advances in technology on health services and education have made tremendous improvements in the curing and eradication of diseases especially in Africa.³ An example is malaria; a canker in Africa which is being taken care of.⁴ According to Yee-Cheong and Juma, biomedical research is one of the recent advancements in science and technology in developing countries.⁵ It has played a major role in diagnosis of diseases and has helped eradicate epidemics in our world through the creation of vaccines and molecular diagnostics.⁶ They however stated that policies must be enacted to help sustain this act. In addition, there is the need for corporations among countries to improve the role of this technology.⁷

In his call for papers on wellbeing innovation for the British Medical Journal, Berger (1999) characterized innovation as 'any mediation that impacts wellbeing and society'. Through time, most central logical revelations have prompted and propelled advances as we find today through science and technology.⁸ According to Fett (2000), science and innovation are unmistakable from each other and one trademark between them is that they are 'catalytic and synergistic'.⁹

Ghana as a country needs investments in science and technology especially in the health sector to enable it combat diseases and epidemics. Special and gradual advances in science and technology have been able to improve the lives of people over the world.¹⁰ Ghana should partake in this phenomenon. Historically, the healthcare system of Ghana was mainly the indigenous system of healthcare delivery before the advent of Europeans.¹¹ Influences and modernization from the British government caused them to introduce some changes in this indigenous health system.¹² Likewise, the scientific medicine introduced by the British government has been the main stay of healthcare delivery in the country. Irrespective of this claim, Adu-Gyamfi and Bing (2016) and Twumasi (2005) argue strongly concerning a medically pluralistic society with various forms of strategies in combating healthcare which has persisted over time.¹³ In his book, "Evolution of Modern Medicine in a Developing Country: Ghana 1880-1960", Addae (1996) enumerated how the British government took steps in setting up hospitals, health centres and dispensaries equipped with the necessary infrastructure to cater for the majority of the whites and some Ghanaians.¹⁴ These pioneering activities laid the foundation of the medical system in the country as human resource were trained and later facilities were improved to facilitate healthcare in Ghana even after independence.

² Thimbleby, Harold. "Technology and the Future of Healthcare", *Journal of Public Health Research* 2.3(2013).161

³ Op.cit

⁴ Ibid

⁵ Juma Calestous and Yee-Cheong Lee, "Reinventing Global Health: The Role Of Science, Technology, And Innovation", (Elsevier, 2005)

⁶ Ibid

⁷ Ibid

⁸ Berger Abi, "The Impact of New Technologies in Medicine", *British Medical Journal*, Vol 318: 314.1999

⁹ Fett Michael, "Technology, Health and Healthcare", *Occasional papers: Health Financial Series*, Vol 5.2000.3

www.health.gov.au

¹⁰ Ministry of Health, "Health Sector ICT Policy and Strategy (Final)" 2005

¹¹ Bonsi K Stephen, "Modernization of Native Healers: Implications for Health Care Delivery in Ghana" *Journal of National Medical Association*, Vol 72, 11,1980

¹² Ibid

¹³ Adu-Gyamfi, Samuel. and Josephine Bing. "Traditional healing narratives from a community in Ghana: An empirical study." *Journal of Basic and Applied Research International* 17, no. 2 (2016): 125-135; Twumasi, Patrick A. *Medical systems in Ghana: A study in medical sociology*. Ghana Publishing Corporation, 2005.

¹⁴ Addae Stephen, "Evolution of Modern Medicine in a Developing Country: Ghana 1880-1960", (Durham Academic Press, 1996)

In the same vein, Adu-Gyamfi (2015) has highlighted the various reforms the British government took in addressing the challenges in Traditional Medicine in Ghana especially during the colonial period.¹⁵ In his article, "From Vital Force to the Scientific or an Admixture: A Historical Discourse on Individuals Value for Indigenous Medical Practices in Ghana" he asserts that some institutions have been created to further improve herbal medicine research in Ghana after independence.¹⁶ Al-Bader et al (2010) has also reported on the roles of government and international agencies in improving scientific medicine in Ghana. Their emphasis was financing and enactment of policies to improve the health sector in Ghana. They also focused on some research institution in the country and how their activities have played a role in improving the healthcare system through science and technology.

Most scholars have written on how science and technology have improved their country and/or other countries. An example is Garcia (2000) who stressed on the importance of science and technology in all aspects of life especially in health.¹⁷ He argued on the role science and technology have played in the health sector of Brazil. In Brazil, life expectancy has increased from 45 to 60 years, a phenomenon which was not in existence for the past 50 years.¹⁸ Garcia (2000) emphasizes the importance of future innovations that will help the Brazilian health sector and increase the life expectancy of the citizens.¹⁹ The twenty-first century has recorded several studies into science and technology which have wider ramifications concerning the area of health care. Studies like Blaya et. al (2009) focus attention on E-health technologies showing promise in developing countries. They argue among other things that the evaluation of personal digital assistance and mobile technology convincingly demonstrate that such devices can be very effective in improving data collection time and quality.²⁰ Similarly, Bukachi and Pakenham (2007) writing on information technology for health in developing countries posited that, to harness the full potential of Information Communication Technology (ICT) to the benefit of health systems, health workers and patients will demand an intricate mix of old and new technologies.²¹ Ok et. al (2015) have also argued concerning biochar technology and how that is being applied to engineering, healthcare and life sciences which has the potential for rapid communication.²² Also, Weingart (2009) researching on "acquiring advanced technology: decision making strategies at twelve medical centres" has argued among other things that the financial impact of a project was the most widely cited criterion of decision but financial considerations were less important than either the impact of technology on the quality of clinical care or its contribution to teaching and research.²³ Again, there are specific studies on various forms of technology that have influenced the capacity of countries and institutions of health to improve the health of their citizens. These include the works of Tolentino and Park (2010) which focus on

¹⁵ Adu-Gyamfi, Samuel. "British colonial reform of indigenous medical practices amongst the Asante people of the Gold Coast, 1930-1960." *African Journal of History and culture* 7, no. 2 (2015): 057-063.

¹⁶ Adu-Gyamfi Samuel, "From Vital Force To The Scientific Or An Admixture: A Historical Discourse On Individuals Value For Indigenous Medical Practices In Ghana", *Journal of Basic and Applied Research international*, 2018

¹⁷ Garcia S Eliot, "Science and Technology and their role in Human Health in Developing Countries", Vol 95, Suppl: 5-7, 2000

¹⁸ Ibid

¹⁹ Ibid

²⁰ Blaya, Joaquin A., Hamish SF Fraser, and Brian Holt. "E-health technologies show promise in developing countries." *Health Affairs* 29, no. 2 (2010): 244-251.

²¹ Bukachi, Frederick, and Neil Pakenham-Walsh. "Information technology for health in developing countries." *Chest* 132, no. 5 (2007): 1624-1630.

²² Ok, Yong Sik, Scott X. Chang, Bin Gao, and Hyun-Joong Chung. "SMART biochar technology—a shifting paradigm towards advanced materials and healthcare research." *Environmental Technology & Innovation* 4 (2015): 206-209.

²³ Weingart, Saul N. "Acquiring advanced technology: Decision-making strategies at twelve medical centers." *International Journal of Technology Assessment in Health Care* 9, no. 4 (1993): 530-538.

U-health systems for patient information management over ubiquitous medical sensor networks,²⁴ Rempher et al's (2003) work which focused on leveraging technology in the advanced practice nursing environment²⁵ and Bashshur and Reardon's "Telemedicine: a new healthcare delivery system."²⁶ Others include Omachonu and Einspruch who dealt with innovation in healthcare delivery systems: a conceptual framework among others.²⁷ None of these studies that cover Africa, Europe and the America focus their attention on science and technology as factors for advancing healthcare in Ghana. Most of these studies are also in the biomedical and physical science with very few recorded in the social sciences. Little or nil has been done in historical studies that concern the Ghanaian case in particular.

2.0 Health Sector Innovations in Ghana: A Historical Review

In 1973, Scott published his "Healthcare delivery and advanced technology".²⁸ He argued among other things that the existing health care system in the United States in particular lacked the vital factor- the significant involvement of those who develop new technology. He argued that a whole league of development engineers and applied scientist were necessary to provide support for any massive venture requiring the development and application of advanced technology and this was and continues to be even in the twenty-first century, the kind of efforts which would be required to resolve the health challenge of countries.²⁹ Of seminal importance to the present contribution is that "as new insights into the prevention and treatment of diseases are attained through biomedical research, they must also be applied to the general healthcare of the population". By the 1970s, in America, the major thesis seemed to be that, there was sufficient biomedical technology for healthcare delivery toward efficiently applying existing technology in a well-managed environment". As can be recalled, within this period, Ghana went through experimentation with civilian and military governments with intermissions of coup de tat. Clearly, the call of Scott is still a burgeoning issue in twenty-first century Ghana. Within the 1960s and 70s, Ghana had not made useful entries in terms of advancement in its medical infrastructure and technology. These woes were accentuated within the 1980s with structural adjustment programmes because of its ailing economy. Earlier and current research has shown that many technological innovations were introduced to the world by the 1970s. In the Ghanaian context, Oseo-Asare (2008) on 'bioprospecting and resistance: transforming poisoned arrows into strophanth pills in colonial Gold Coast, 1885–1922', captures the nineteenth and early twentieth centuries and argues among other things that "breakthroughs in pharmaceutical chemistry increased international demand for *Strophanthus* seeds, prompting an unsuccessful export scheme from the Gold Coast during the First World War."³⁰ Reading narratives of drug discovery in Europe against colonial politics in West Africa reveals the world history in which pharmaceuticals continue to be embedded". Again, in her research, "scientific equity: experiments in laboratory education in Ghana", Osseo-Asare (2013) reports that during the 1960s, the Ministry of Education in Ghana created a network of school laboratories to increase scientific literacy among young citizens. During this period, education officials and university scientists worked with teachers to create lesson plans that were relevant to science.

²⁴ Tolentino, Randy S., and Sungwon Park. "A study on U-healthcare system for patient information management over ubiquitous medical sensor networks." *International Journal of Advanced Science and Technology* 18, no. 1 (2010): 10.

²⁵ Rempher, Kenneth J., LTC Caterina EM Lasome, and Terry J. Lasome. "Leveraging palm technology in the advanced practice nursing environment." *AACN Advanced Critical Care* 14, no. 3 (2003): 363-370.

²⁶ Bashshur, Rashid L., Timothy G. Reardon, and Gary W. Shannon. "Telemedicine: a new health care delivery system." *Annual review of public health* 21, no. 1 (2000): 613-637.

²⁷ Omachonu, Vincent K., and Norman G. Einspruch. "Innovation in healthcare delivery systems: a conceptual framework." *The Innovation Journal: The Public Sector Innovation Journal* 15, no. 1 (2010): 1-20.

²⁸ Scott, Charles D. "Health care delivery and advanced technology." *Science* 180, no. 4093 (1973): 1339-1342.

²⁹ Ibid

³⁰ Osseo-Asare, Abena Dove. *Bitter roots: The search for healing plants in Africa*. University of Chicago Press, 2014.

The government hoped that scientifically minded school children would be better prepared to staff the industries of the future.³¹ Also, she argued that the adoption of laboratory norms represented a desire for scientific equity, rather than a condition of cultural mimicry. She reports that her interviews with ministry officials and science educators, alongside letters and reports, indicate how students and teachers appropriated the laboratories in the small West African nation. She concludes among other things that their experiences in mobilizing resources from across Ghana and around the world provide a metaphor for ongoing efforts to establish access to scientific goods in Africa.³² Significantly, her research on “Bitter roots: African science and the search for healing plants in Ghana, 1885-2005” further highlights the transitions Ghana has been through since the nineteenth century up to the early years of the twenty-first century to advance in the area of medical discovery with its concomitant challenges of funding among other challenges within the colonial and post-colonial periods. In addition to the work of Osseo-Asare, Addae’s (1996) “History of Western medicine in Ghana 1880-1960” also captures the activities of laboratarians and the general medical field of the Gold Coast and Ghana for that matter from the 1880s to the 1960s. These studies including that of Adu-Gyamfi (2018) from vital force to the scientific or admixture capture the essence of science and technology in advancing both institutionalized orthodox medical care and traditional medicine in Ghana.

The above notwithstanding, the current study is interested in teasing out responses from workers in the health sector of Ghana to ascertain the extent to which science and technology have been able to advance healthcare in particular since the 1960s. It is significant to note that, globally, large sums of money have been spent in automating or mechanizing portions of clinical laboratories, and computers have and still are gradually becoming commonplace in most large hospitals, for example, to diagnose diseases and also to solve issues of large data problems. Globally, these important developments have been largely responsible for the higher quality of patient care. Significantly, based on the responses from our respondents, this paper answers these research questions. First, how have science and technology effectively and efficiently supported healthcare delivery system in Ghana? Second, how have post-independence health sector reforms in Ghana produced out of advances in science and technology, been responsive to the needs of patients?

3.0 Research Methods

The Study used convenient and snowballing sampling to reach health personnel from hospitals in Kumasi in the Ashanti Region of Ghana. The choice of Kumasi became necessary due to its eclectic nature. Kumasi is quintessential of the typical Ghanaian situation due to its eclectic nature. In this regard findings from the research could be useful for some generalizations. Questionnaires were developed to suit the aim of the study and were administered. Respondents included persons from the school of pharmacy, medical schools as well as nurses and midwifery professionals drawn from medical institutions in Kumasi. The various responses obtained from the respondents were reduced to frequency tables using Statistical Package for Social Science (SPSS) to aid the analysis.

Secondary data engaged were reaped from books and journal articles on Ghana’s health sector taken from both traditional medicine and the evolution and development of western or scientific medicine in Ghana. The literature included Saleh Karima’s work on Health Sector in Ghana: A Comprehensive assessment, Adu-Gyamfi’s work on ‘From Vital Force to the Scientific or an Admixture: A Historical Discourse on

³¹ Osseo-Asare, Abena Dove. "Scientific equity: Experiments in laboratory education in Ghana." *Isis* 104, no. 4 (2013): 713-741.

³² Ibid

Individuals Value for Indigenous Medical Practices in Ghana', and the works of Al-Bader Sara and Daar S Abdallah et. al. on Science-based health innovation in Ghana: health entrepreneurs point the way to a new development path. Some information from internet articles was also retrieved to enhance knowledge in the study. In addition, oral interviews were conducted using interview guides to solicit qualitative responses from some key informants in the Ghana health sector. The other key informants were from the directorates in hospitals, personnel in academia and Ghana health Service. The information derived from these sources has been presented thematically.

4.0 Results and Discussion

This section deals with the analysis and discussion of data collected from selected health professionals by administering questionnaires and interviewing some key informants who were mostly heads of departments. This section outlines the various ways in which the Ghanaian health sector has been improved through the role of science and technology. It outlines the impact of various science and technological innovations placed in hospitals through government policies and initiatives as well as assistance from other bodies and also highlights the state of the healthcare system in Ghana.

4.1 Impact of science and technology on health

The focus of the study is on how science and technology impacted healthcare from the 1960s to 2015. Recent anecdotal debates among interest groups and scholars within and outside the medical field have suggested that science and technology have done harm than good. But most schools of thought believe that science and technology have helped to improve the health sector due to the numerous inventions and discoveries in medicine and equipment for treatment of diseases which have helped to improve the life expectancy of humans. Others believe that science and technology have contributed to the woes of mankind, especially with the invention of biomedical weapons and medical crime against humanity. Concerning same, a renowned Holland scientist Van Dongen (2016) has alleged that:

“AIDS and Ebola are medical crime sanctions against Africa to retard the growth of the continent, depopulate Africa, to generate money for the corrupt pharmaceutical companies, in search of power over African leaders and the continent’s vast resources by western governments and the corrupt media have made it possible”³³

The above notwithstanding, one of our informants hinted that, science and especially technology have improved the Ghana health sector since he entered into the profession. He argued among other things that he has seen improvements in the area of equipment and drug efficacy.³⁴ Again, another interviewee attested to the overall improvements of the Ghana health sector due to science and technology but argued that most developments and advances are mostly done in the tertiary hospitals, namely; the teaching hospitals like Korle-bu and Komfo Anokye teaching hospitals.³⁵ According to an informant, science and technology have contributed immensely towards the advancement of the Ghana Health sector but noted also that what is lacking is the ambulance service.³⁶ Another informant also agreed that the development in the health sector of Ghana is at a slow pace and sometimes progress has been halted for years; this

³³ “Top World Scientist Prove Me Wrong If AIDS And Ebola Aren’t Bio-Weapons” Accessed on 2nd May 2018
www.modernghana.com

³⁴ Interview with Dr Kwasi Yeboah-Awudzi at the Ashanti regional Directorate, 9th April 2018

³⁵ Interview with Mrs Adelaide Acheampong at the Manhyia District Hospital’s D.D.N.S Office, 24th April 2018. She indicated that the teaching hospitals are called tertiary hospitals.

³⁶ Interview with Mr Asante at St John’s Ambulance Kumasi branch office, 19th March

greatly impedes healthcare delivery.³⁷ As a practicing mid-wife, she is not fully persuaded and satisfied with the input of stakeholders, though she agrees that the health sector of Ghana has come a long way in terms of science and technological innovations.³⁸ According to a respondent and an interviewee, inadequate infrastructure and human resource impedes healthcare delivery and conscious efforts are being made to improve the Ghana health sector through the provision of infrastructure and health personnel among other things.³⁹ Also, an interviewee has reported that traditional medicine has also been affected by the increasing effect of science and technology, in the sense that it has equipped the human resource with scientific knowledge in preparing and administering herbal medicine to patients.⁴⁰ Another informant added that with the advancement of science and technology, procedures like quantum analgesics for diagnosis and viral evaluation of patients have helped shaped the preparation of pharmacopeia.⁴¹

The findings are consistent with the works of Osseo-Asare (2014) and Adu-Gyamfi (2016) concerning the advances that traditional medicine has made due to improvement in testing, research and the use of scientific tools for diagnosis among other things. Also, the results confirm the work of Afarikumah (2014) which supports that technology supports the progress of healthcare. For example, he reports that concerning solutions which are provided through eHealth (“...an emerging field of medical informatics, referring to the organisation and delivery of health services and information using the internet and related technologies”) initiatives within hospitals include Hospital Information Systems (HIS), telemedicine services, Electronic health records and Internet services. Again, he reports on the e-health project; which is an “electronic health delivery system, launched to enable doctors reach their patients online and bring health care to the door steps of the citizenry. It has a remote doctor/patient interface, which allows a patient to see a doctor without leaving his home or office. This does not seek to prevent patients from visiting hospital but to augment existing health care delivery services. In order to assess the product, one has to go online to book an appointment with a doctor on www.ehealthghana.com after which an appointment coordinator will assign doctors to patient depending on the ailment”.⁴² These strategies are seen in the various mobile support services as seen in the Vodaphone Mobile Health Line Project, the Mahiri Mobile Project among others which have the propensity to enhance or support primary care in the health sector of Ghana.

In an attempt to ascertain the impact of science on medicine, the researchers examined some variables that were useful in enabling the researchers to measure the level of impact; whether it is good or bad. Respondents were to indicate the extent to which they agree or disagree to each statement. To make the responses more meaningful, numerical values were assigned to the responses as follows: with 1 - Strongly

³⁷ Interview with Mrs Abedua Billson via phone call on 9th May 2018, She is a senior staff midwife at the Asuofia Health Centre.

³⁸ Ibid

³⁹ “Healthcare in Ghana”, *YouTube*, uploaded by TV3 Network on 22nd December 2016
www.youtube.com

She is a doctor from the Greater Accra Regional Hospital accessing the state of healthcare in Ghana especially at the new refurbished state of the art Greater Accra Regional Hospital comparing its capabilities before and after renovation. She said this on TV3’s Sunrise program health segment.

⁴⁰ Interview with Dr Stephen Y. Gbedema at the Department of Herbal Medicine (KNUST), 18th May 2018.

⁴¹ Interview with Dr George Henry Sam at the Department of Herbal Medicine (KNUST), 17th May 2018

⁴² Afarikumah, Ebenezer. “Electronic health in Ghana: current status and future prospects.” *Online journal of public health informatics* vol. 5, 3 230. 5 Feb. 2014, doi:10.5210/ojphi.v5i3.4943

Agree, 2 - Agree, 3 - Neutral, 4 -Disagree, 5 -Strongly Disagree. The mean and standard deviation for the responses of each statement were then calculated and interpreted as shown in Table 1.1;

Table 1.1 Views of People Concerning the Role of Science and Technology in the Health Sector of Ghana

Statement	Strong Agree	Agree	Undecided	Disagree	Strongly Disagree	Mean	Std. Deviation
	<i>f</i> (%)	<i>F</i> (%)	<i>f</i> (%)	<i>F</i> (%)	<i>F</i> (%)	\bar{x}	
Advancement in Science and Technology in the health sector since 1960s has...							
helped to improve treatment of patients	33 (80.5)	9 (22.0)	1 (2.4)	0 (0)	0 (0)	0.28	0.777
helped prevent death resulting from human error	4 (9.8)	37 (90.2)	0 (0)	0 (0)	0 (0)	1.21	1.170
helped reduce the workload on health professionals	4 (9.8)	20 (48.8)	0 (0)	4 (9.8)	13 (31.7)	2.50	1.404
decreased infant and maternal mortality	39 (95.1)	2 (4.9)	0 (0)	0 (0)	0 (0)	0.71	0.283
helped prevention of communicable diseases	30 (73.2)	2 (4.9)	9 (22.0)	0 (0)	0 (0)	1.99	1.021
helped to fight terminal diseases such as cancer and HIV/AIDS	23 (56.1)	3 (7.3)	1 (2.4)	14 (34.1)	0 (0)	1.42	2.847
improved patient's turnover and compliance	17 (41.5)	3 (7.3)	1 (2.4)	14 (34.4)	6 (14.6)	2.42	1.046
improved the effectiveness and efficacy of drugs	40 (97.6)	1 (2.4)	0 (0)	0 (0)	0 (0)	1.05	0.023
provided more sophisticated devices for treatment	41 (100)	0 (0)	0 (0)	0 (0)	0 (0.0)	1.00	0.006

provided less painful treatment methods	11 (26.8)	16 (39.0)	0 (0)	8 (17.0)	6 (14.6)	3.42	1.079
Improved traditional medicine role in the health sector over the last few decades	7 (17.1)	16 (39.0)	3 (7.3)	15 (36.6)	0 (0)	2.60	1.166

Source: Field Data, March (2018)

4.1.1 Improved Patient Treatment

From Table 1.1 the respondents were asked to rate the extent to which they agree to science and technology serving as agencies to improve treatment of patients since 1960. From Table 1.1 the statement recorded a mean score of 1.28 and the standard deviations of 0.77. The mean score obtained lies between strongly agree and agree on the scale but it is more closer to strongly agree, hence, majority of the respondents hold a strong belief that science and technology have helped to improve the treatment of patients since Ghana gained independence. This interpretation is validated by the frequency of 33 respondents who noted that they strongly agree with the statement. The study observed that there has been improvement in the treatment of many diseases including cancer with the concurrent treatment of chemotherapy and radiotherapy. Again, the respondents indicated that science and technology has provided improved treatment and clinical management of poverty related disease over the past decades.

An interviewee hinted that there is a steady improvement in the treatment of patients over the years with the steady advancement in the provision of equipment and infrastructure. However, this does not happen from year to year.⁴³ He also argues that in most cases, that is, for some number of years, they are left with same old equipment and drugs to work with.⁴⁴ Also, basic first aid which is the scoop and run and cardio resuscitation which have been the only methods administered to patients before they are sent to the hospital for treatment, have aided in treatment of patients.⁴⁵ The Automated External Defibrillator (AED), a device used to detect cardiac problems has also contributed in the treatment of patients in contemporary times.⁴⁶ An expert informant agrees that indeed treatment of patients have improved, but steadily.⁴⁷

4.1.2 Reduction in death resulting from Medical and Human Error

Respondents were also asked to rate the extent to which they agree whether science and technology have helped in deaths resulting from human and medical errors. From table 1.1, the statement recorded a mean score of 1.21 and the standard deviations of 1.17. The mean score obtained lies between Agree and Neutral but it is much closer to agree. Hence, based on the mean score, majority of respondents agree that science and technology have helped to prevent death that result from medical and human errors. This conclusion is authenticated by the frequency of 37 (90.2%) respondents who agreed with the statement, which is, medical error is a preventable adverse effect of care, whether it is evident or harmful to the patient. Medical error includes inaccurate or incomplete diagnosis or treatment of a disease. Hebert et al (2001) have reported that “medical errors are usually considered to be preventable adverse medical events.” “Patients are harmed as a consequence of either what is done to them —errors of commission —

⁴³ Interview with Dr Kwasi Yeboah-Awudzi at the Ashanti regional Directorate, 9th April 2018

⁴⁴ Ibid

⁴⁵ Interview with Mr Asante at St John’s Ambulance Kumasi branch office, 19th March

⁴⁶ Interview with Mr Asante at St John’s Ambulance Kumasi branch office, 19th March

⁴⁷ Interview with Mrs Abedua Billson via phone call on 9th May 2018

or what is not done but should have been done to prevent an adverse outcome — errors of omission. Negligent actions should be distinguished from honest mistakes. The former are preventable, harmful errors that fall below the standard expected of a reasonably careful and knowledgeable practitioner acting in a similar situation. Negligence, strictly speaking, can be established only in a court of law. Whether all errors are truly preventable can be debated”.⁴⁸ Though an ethical question, the Ghanaian context begs for some answers due to the posture of some physicians, the specialised nature of the medical field and the level of education, understanding, and the ignorance of health seekers. Globally, it is estimated that 142,000 people died in 2013 from adverse effects of medical treatment; this is an increase from 94,000 in 1990.⁴⁹ However, a 2016 study showed the yearly result of medical error in the U.S. alone at 251,454 deaths, which suggests that the 2013 global estimate may not be accurate.⁵⁰

4.1.3 Reduction of Workload on Health Professionals

Respondents were also asked to rate the extent to which they agree that science and technology have contributed in reducing the workload on health professionals. From Table 1.1, the statement recorded a mean score of 2.50 and the standard deviation of 1.404. The mean score obtained lies between agree and neutral on the rating scale, however, it is closer to neutral. The standard deviation suggests that the response among participants spread across the scale. From Table 1.1 it is evident that majority of respondents agree to the statement that science and technology have helped reduce the workload on them, however, a significant number of respondents indicated that they strongly disagree with the statement that their workload has been reduced. This interpretation is validated by the percentage of respondents who agree and those who strongly agree, these represent 48.8% and 31.7% respectively.

Some respondents indicated that the work they do cannot be performed by an assistive technology. However, technology has facilitated speed their work but not reduction in their work per se. Some participants indicated, the rise in workload of health professionals meant that they are spending more time dedicated to their profession with less time spent on themselves. However, some participants particularly among hospital administrators have hinted that software and other related programmes are now in place in majority of hospitals to assist them with their everyday task. This notwithstanding, some nurses and midwives hinted that there are no software and programmes to help them take care of patients. Recent comparative studies from the United Kingdom have showed how information communication technology has impacted the work of teachers. The research of Selwood and Pilkington (2005) showed that in the UK, overall, teachers believed that Information Communication Technology (ICT) helped to reduce workload, making them more productive as teachers.⁵¹ In their research commentary on “the digital transformation of healthcare: current status and the road ahead” Agarwa et. al (2010) argued that, there is substantial consensus that the digital transformation of healthcare through broad and deep use of health information technology (HIT) across the health-care ecosystem, in conjunction with other complementary changes,

⁴⁸ Hébert, Philip C., Alex V. Levin, and Gerald Robertson. "Bioethics for clinicians: 23. Disclosure of medical error." *Cmaj* 164, no. 4 (2001): 509-513.

⁴⁹ GBD 2013 Mortality and Causes of Death, Collaborators, “Global, Regional, and National Age-Sex Specific All-Cause and cause-Specific Mortality for 240 Causes of Death, 1990-2013: A Systematic Analysis for Global Burden of Disease Study 2013”, *Lancet*. 10 January 2015
www.ncbi.nlm.nih.gov

⁵⁰ Marcia Frellick, “Medical Error is Third Leading Cause of Death in US” Accessed on 2nd May 2018
www.medscape.com

⁵¹ Selwood, Ian, and Rachel Pilkington. "Teacher workload: using ICT to release time to teach." *Educational Review* 57, no. 2 (2005): 163-174.

can reduce costs and improve quality⁵². It is however, clear from the current research that irrespective of the set-backs within the Ghana health sector, there is no doubt that advances in science and technology would have the propensity to improve the performance and result of medical staff and health facilities in general.

4.1.4 Decrease in Infant and Maternal Mortality Rate

Participants of the study were asked to rate their level of agreement with the statement that science and technology have helped decrease infant and maternal death in Ghana since Ghana gained independence. As shown in Table 1.1, the statement recorded a mean score of 0.71 and standard deviations of 0.23. The mean score of 0.71 shows that majority of the respondents strongly agree that infant and maternal mortality death rate have decreased drastically. From the results 95.1% of the respondents indicated that they strongly agree to the statement. Participants in the study indicated that premature birth, low birth rate, sudden Infant Death Syndrome (SIDS)⁵³, malnutrition, infectious diseases and early childhood trauma have decreased. The respondents indicated that, prior to independence, Ghana lacked access to affordable and professional healthcare resources and skilled personnel during deliveries, which resulted in high maternal and infant mortality rate. It is significant to emphasize that Adu-Gyamfi et. al (2017) have reported on the issues of child mortality due to diseases which affect children during the early stages of their lives.⁵⁴ The progress made thus far in the reduction of maternal and infant mortality has really come about due to training of health personnel and midwives as well as retooling of traditional midwives to ensure that they adopt best practices to support women during their deliveries and to take good care of themselves during the pre-natal and post-natal periods.⁵⁵

4.1.5 Prevention of Communicable Diseases

Respondents were also asked to rate the extent to which they agree whether science and technology helped to prevent communicable diseases. From Table 1.1, the statement recorded a mean score of 1.99 and standard deviations of 1.021. The mean score obtained lies closely to “strongly agree” which imply that respondents strongly agree to the statement that science and technology have helped to improve treatment and prevention of certain communicable diseases. In addition, the standard deviation of 1.021 indicated that all the responses obtained were closer to the dominant opinion. However, a significant number of participants share a neutral view on the statement. This interpretation is validated by the frequency of respondents who strongly agree and the neutral view on the statement. These represent 73.2% and 22.0% respectively. Respondents for the study pointed out that science and technology have helped to prevent diseases that may be transmitted from person to person. Health professionals recounted measures that have been taken to decrease contact with reservoirs of infections. These include the use of condom as a means to prevent transmission of HIV and other sexually transmitted diseases. Again, the simplest among such measures is hand washing with soap and water to prevent transmission of many

⁵² Agarwal, Ritu, Guodong Gao, Catherine DesRoches, and Ashish K. Jha. "Research commentary—The digital transformation of healthcare: Current status and the road ahead." *Information Systems Research* 21, no. 4 (2010): 796-809.

⁵³ SIDS is the unexplained death, usually during sleep of a seemingly healthy baby.

⁵⁴ Adu-Gyamfi, Samuel, Edward Brenya, and Peter Nana Egyir. "Public Health in Colonial and Post-Colonial Ghana: Lesson-Drawing for the Twenty-First Century." *Studies in Arts and Humanities* 3, no. 1 (2017): 34-54.

⁵⁵ Adu-Gyamfi, Samuel, Razak Mohammed Gyasi, and Bennard Adubofour Poku. "Women Assisting Women in a Village in Ghana: The Role of Traditional Birth Attendants in Wurubegu-Anansu." *International Journal of Body, Mind and Culture* 5, no. 1 (2018): 46-60.

communicable diseases that was emphasised by the Centre for Disease Control (CDC).⁵⁶ Comparatively, the world has witnessed administrative histories of public health written in the 1950s and early 1960s which documented parliamentary reforms and technological developments that helped to create healthier environments, which in turn reduced the spread of infectious diseases.⁵⁷

4.1.6 Fight against Terminal Diseases

Respondents were also asked to rate the extent to which they agree to the statement that science and technology have helped the fight against terminal diseases. From Table 1.1, the statement recorded a mean score of 1.42 and the standard deviation of 2.847. The mean score indicated that majority of respondents strongly agree that the fight against terminal disease has increased over the past six decades, however, considering the standard deviation of the statement there are a number of respondent who have contrary positions concerning the dominant view. This interpretation is validated by the percentage of respondents who expressed that they strongly agree and disagree, representing 56.1%, and of 34.1% respectively.

Respondents who were medical doctors indicated that certain incurable disease that cannot be adequately treated and are reasonably expected to result in the death of the patient over a period of time are becoming increasingly manageable with the help of science and technology. Some respondents indicated that a disease such as cancer that was believed to be incurable some four decades ago is now manageable. Respondents indicated that cancer could now be treated by surgery, chemotherapy, radiation therapy, hormonal therapy and synthetic lethality. They further assert that science and technology have made it evident that choice of therapy depends upon the location and the grade of the tumour as well as the stage of the disease. According to an interviewee, these cases are mostly treated in tertiary hospitals because they have the necessary equipment and specialized human resource to handle extreme cases better.⁵⁸ This attest to the fact that the level of the ability to tackle these cases sometimes serve as the basis to determine the hierarchy of clinics, health centres and hospitals⁵⁹

4.1.7 Improved Patient turnover and compliance

Respondents were also asked to rate the extent to which they agree whether science and technology have increased patients' turnover and compliance. From Table 1.1, the statement recorded a mean score of 2.42 and the standard deviations of 1.046. The mean score obtained lies between agree and neutral but it is much closer to agree. Therefore, based on the mean score, majority of respondents agree that science and technology have increased patients turnover and compliance. However, the standard deviation shows that some respondents were in disapproval of the view that science and technology have increased patients turn- over. This interpretation is validated by the percentage of respondents who strongly agree and disagree to the statement, which are 41.5% and 34.1% respectively.

Responses from participants, particularly among social workers, nurses and midwives indicated that patients turnover in every hospital is something that they are most familiar with because, they admit transfer or discharge every patient from their unit. Some participants indicated that science and technology have raised public trust in the health system which has boosted patients' turnover. In their recent study,

⁵⁶ CDC launched Communicable Disease Prevention and Control Service which is an integrated mix of programs in 1964 which covers surveillance and control of specific communicable diseases, policy and guideline development and advanced research

⁵⁷ Porter, Dorothy. *Health, civilization and the state: a history of public health from ancient to modern times*. Routledge, 2005.

⁵⁸ Interview with Mrs Adelaide Acheampong at the Manhyia District Hospital's D.D.N.S Office, 24th April 2018

⁵⁹ Interview with Dr Kwasi Yeboah-Awudzi at the Ashanti regional Directorate, 9th April 2018. He gave a brief history of the Suntreso Government hospital on how it developed from a health centre to a hospital.

Van Fosson et. al. (2017) argued among other things that, patient turnover influences the quality and safety of patient care. Nursing leaders should account for patient turnover in workload and staffing calculations.⁶⁰ In the Ghanaian context, this area needs further empirical research to clarify the influence of patient turnover on the quality and safety of nursing care in particular. Some pharmacists and doctors who participated in the study indicated that there has been improvement in the degree to which patients correctly follow medical advice and the use of medicine among other things. Participants indicated that cost of medication play a major role in medical compliance. However, because of advance in science and technology, several relatively cheaper medicines are available for patients to choose from. It is important to add that the introduction of the National Health Insurance in Ghana has increased accessibility to hospitals which has allowed for early detection of health challenges that could be terminal for treatment to begin on time. However, the question of sustainability of Ghana's Health Insurance continues to be at the heart of national discourse and the work of researchers.⁶¹

4.18 Improvement in Effectiveness and Efficacy of Drugs

Respondents were also asked to rate their level of agreement that science and technology have increased the effectiveness and efficacy of drugs. From Table 1.1, the statement recorded a mean score of 1.05 and the standard deviation of 0.023. From the mean score almost all respondents indicated that they strongly agree to the statement that there has been improvement in the effectiveness and efficacy of drugs due to advancement in science and technology. In addition, the standard deviation of 0.023 all the responses were closer to the mean. This interpretation is validated by the percentage of respondents who strongly agree, as shown in the percentage score of 97.6%. This is consistent with the research of Osseo-Asare (2014) whose research work on Bitter roots: a search for healing plants in Africa spans from pre-colonial, colonial and post-colonial times up to the twenty-first century captures the efforts and transitions in developing medicines from the African herb with emphasis on the Ghanaian context.⁶² Essentially, in the bio-medical field too, improvement in training of pharmacists in Ghana and elsewhere in Africa has aided the production of drugs to meet the health needs of the African population and Ghana in particular.

Respondents who were pharmacists indicated that major part of the drug development process is to weed out those compounds whose side effects overwhelm their therapeutic effects. They further indicted that a drug's efficacy is the ability of the drug to treat whatever condition the drug is indicated for and the effectiveness of drug refers to how the drug works in a real-world situation. Experts who took part in the study expressed that science and technology has helped in providing the necessary interventions to meet the critical medical needs of the people of Ghana. In addition, the improvement of drugs is one of the most important areas that have greatly been developed both in traditional medicine and scientific medicine.⁶³ This is buttressed by an interviewee who argues that careful procedures are taken to improve the efficacy of drugs yearly.⁶⁴ New innovations and additional drugs are always added to the market by various pharmaceutical companies which are carefully scrutinized by the Food and Drugs Board. According to Adu-Gyamfi (2018), two doctors have treated seemingly untreatable illnesses through their highly

⁶⁰ Van Fosson, Christopher A., Linda H. Yoder, and Terry L. Jones. "Patient turnover: A concept analysis." *Advances in Nursing Science* 40, no. 3 (2017): 300-312.

⁶¹ Adu-Gyamfi, Samuel, and Aminu Dramani. "Sustaining Ghana's National Health Insurance Scheme Through Preventive Healthcare Strategies and Legislation." *International and Multidisciplinary Journal of Social Sciences* 6, no. 1 (2017): 47-69.

⁶² Osseo-Asare, Abena Dove. *Bitter roots: The search for healing plants in Africa*. University of Chicago Press, 2014.

⁶³ Interview with Dr Kwasi Yeboah-Awudzi at the Ashanti regional Directorate, 9th April 2018

⁶⁴ Interview with Mrs Adelaide Acheampong at the Manhyia District Hospital's D.D.N.S Office, 24th April 2018

improved expertise in traditional medicine.⁶⁵ A respondent noted that, the Centre for Plant Medicine Research is equipped with standardized instruments and devices that produced serious scientific work like the Tonica: a blood tonic and formulated herbal Analgesic capsules. These drugs are prepared under serious radiations like UVI and infrared rays which have improved drug production.⁶⁶ The revolutionary wind blowing from traditional medicine has created the incorporation of traditional medicine into hospitals.⁶⁷ Most health centres and some hospitals have started this initiative and it is gradually and slowly changing the phase of healthcare delivery.⁶⁸ Some departments are not affected with this initiative though its immense contribution in the area of traditional midwifery and support of women during child birth cannot be gainsaid.⁶⁹

4. 1.9 Provision of More Advanced and Sophisticated device and tools for Treatment

The statement that science and technology has helped with the provision of more sophisticated device and tools for treatment of diseases had a mean score of 1.00 with a standard deviation of 0.006. Most of the respondents confirmed that science and technology have made provision for sophisticated devices and tool for treatment of diseases. The standard deviation of 0.006 indicated there was not a single deviation from the dominant responses which is validated by the percentage (100%) affirmation that they strongly agree to the statement. In addition, as stated elsewhere in this research, Information Communication Technology (ICT) has contributed to the efficient provision of data on patients and their illnesses. It is one area in which advanced computers and the necessary software have been able to significantly add to advanced hospital care in Ghana.⁷⁰ Over the years, there has been a steady addition of more advanced and sophisticated devices to match the level and number of illnesses that reported at the hospitals and the government of Ghana has made efforts to bridge this gap.⁷¹ It is imperative to add that on July, 2010, the Government of Ghana launched the national e health strategy. The key strategies under the national e-health strategy included streamlining the regulatory framework for health data and information management, building sector capacity for wider application of e-Health solutions in the health sector, Increasing access and bridging equity gap in the health sector through the use of Information and Communication Technology, and Towards a paperless records and reporting system among other things.⁷²

4.1.10 Provision of Less Painful treatment Methods

In addition, the mean for the statement 'science and technology have made it possible to provide less painful treatment methods available to patients' was 3.42 with a standard deviation of 1.079. Thus, majority of the respondents held varied opinions concerning this assertion. Significantly, the nature of

⁶⁵ Adu-Gyamfi Samuel, "From Vital Force To The Scientific Or An Admixture: A Historical Discourse On Individuals Value For Indigenous Medical Practices In Ghana", *Journal of Basic and Applied Research international*, 2018

⁶⁶ Interview with Dr George Henry Sam at the Department of Herbal Medicine (KNUST), 17th May 2018.

⁶⁷ Interview with Mrs Adelaide Acheampong at the Manhyia District Hospital's D.D.N.S Office, 24th April 2018

⁶⁸ Interview with Mrs Abedua Billson via phone call on 9th May 2018

⁶⁹ Ibid, Adu-Gyamfi, Samuel, Razak Mohammed Gyasi, and Bennard Adubofour Poku. "Women Assisting Women in a Village in Ghana: The Role of Traditional Birth Attendants in Wurubegu-Anansu." *International Journal of Body, Mind and Culture* 5, no. 1 (2018): 46-60.

⁷⁰ Interview with Mrs Abedua Billson via phone call on 9th May 2018

⁷¹ "Healthcare in Ghana", *YouTube*, uploaded by TV3 Network on 22nd December 2016

www.youtube.com

This statement was made by Mr Mustapha Seni who was interviewed together with Dr Bernice on the show.

⁷² Blaya, Joaquin A., Hamish SF Fraser, and Brian Holt. "E-health technologies show promise in developing countries." *Health Affairs* 29, no. 2 (2010): 244-251.

professional duties to patients might differ from one another. The standard deviation of 1.42 also indicated that the responses to this statement are widely spread around the mean. This implies that while most of the respondents agree with the statement, other participants disagreed. However, an expert informant from the Manhyia Hospital Kumasi argued that she was sceptical about this issue stating that she is not really impressed about how science and technology have provided less painful methods in treating clients.⁷³ Her views notwithstanding, the theorizing literature posit otherwise. Recently, Hiroshima University has published its preliminary research which points to new targets for chronic pain relief.⁷⁴ The medical breakthrough in 1846 in anaesthesia has continued to profit the journey for painless surgery.⁷⁵

4.1.11 Improvement in The Role of Traditional and Alternative Medicine in the Health Sector

Further, the mean for the statement, 'science and technology have improved traditional medicine's role in the health sector over the years' was 2.60 with standard deviation of 1.166. This suggests that respondents have mixed level of agreement about how traditional medicine has contributed to health delivery in Ghana. The number of respondents who agree with the statement almost equate those who disagree. The standard deviation value of 1.166 also indicated that the responses to this statement were far apart. Thus, some group of respondents have different opinion about this statement. That is, while some participants indicated they agree with the statement, significant minority disagree. However, a nurse at the Suntreso Government hospital stated that there is an evolution in the efficacy and development in the production of traditional medicine which has caught the attention of Ghanaians especially the middle class group who prefer purchasing such drugs than waste time coming to the hospital.⁷⁶

Science and technological support have been added to traditional medicine through the establishment of the Centre for Plant Medicine Research and the establishment of the Herbal Medicine Department at KNUST where various pharmacopeia have been developed and faculties trained respectively.⁷⁷ An expert informant from the Department of herbal medicine, KNUST, indicated that the movement of the Centre for Plant Medicine from its former location to its present area in Mampong accounted for the immense contribution of the Centre through science and technology.⁷⁸ He further mentioned that the initial infrastructure of the Centre constituted a brick housed room with huge pots for boiling herbs and other pharmacopeia and big ladders, thus, the new and present location houses mechanized equipment and advanced devices to produces drugs.⁷⁹ Initially, patients came along with their own bottles and gallons to collect drugs but the Centre put a stop to this by providing bottles packaged under hygienic and standard conditions.⁸⁰

He further lamented the poor and horrible practices due to the low standard of the Centre during its early days with very minimal number of staff.⁸¹ Only one technician and a biochemistry graduate from KNUST

⁷³ Interview with Mrs Adelaide Acheampong at the Manhyia District Hospital's D.D.N.S Office, 24th April 2018. Health personnel indicate that patients are referred to as clients.

⁷⁴ Hiroshima University, New target for chronic pain relief confirmed by scientists: Scientists observe drug target that can reduce pain when activated. <https://www.sciencedaily.com/releases/2019/03/190307103147.htm>

⁷⁵ Robinson, Daniel H., and Alexander H. Toledo. "Historical development of modern anesthesia." *Journal of Investigative Surgery* 25, no. 3 (2012): 141-149.

⁷⁶ The nurse is a national service personnel whose concern centred on how traditional medicine has been on the rise and helping cure diseases in the country and how it is sold everywhere.

⁷⁷ Interview with Dr George Henry Sam at the Department of Herbal Medicine (KNUST), 17th May 2018.

⁷⁸ Ibid

⁷⁹ Ibid

⁸⁰ Ibid

⁸¹ Ibid

worked there because personnel refused to locate to the remote rural area where the Centre was located.⁸² The advanced nature of the Centre attracted resource personnel and students in 1993 and under the supervision of our expert informant from the Department of Herbal Medicine, KNUST, 105 formulae for various diseases were documented. The Centre is currently using thirty-two (32) of such formulae.⁸³ In 1996, the Centre gained international recognition when he documented the first health report and presented it in China.⁸⁴

4.2. Contribution of Orthodox and Traditional Medicine

This section of the study sought to ascertain the contribution that both scientific and traditional medicine have had on the health sector since 1960. Respondents were asked to indicate which of the two medicines have improved or made greater impact in the health sector since the 1960s. Table 1.2 shows the summary of response from the field.

Table 1.2: Positions of Respondents Concerning the Contribution of Scientific and Traditional Medicine

	Frequency	Percentage
Scientific Medicine	41	100
Traditional Medicine	0	0.0
Total	41	100.0

Source: Field Data, March (2018)

As explicit from Table 1.2, it is evident that all the respondents indicated that scientific medicine have been approved and made a great impact on the health sector of Ghana than traditional medicine. Although some interviewees agree that traditional medicine has made significant contribution towards the healthcare of the people of Ghana. It seems to have been outpaced by orthodox scientific medicine. An interviewee indicated that preparation of drugs is far advanced in the realm of scientific medicine than the area of traditional medicine.⁸⁵ She buttresses the point that packaging and dosage have been carefully enhanced through scientific medicine, but traditional medicine is yet to catch-up.⁸⁶ According to an expert informant, scientific medicine has improved the availability of the provision of records, in terms of statistics.⁸⁷

Another respondent affirmed the fact that traditional medicine has improved a lot, especially concerning the efficacy of drugs. Recent advertisement on radio, television and social media among other traditional avenues keep increasing the popularity and the patronage traditional medicine among Ghanaian in urban and rural communities. Over the years, there has been conscious effort to improve traditional medicine by the Government of Ghana and other stakeholders.⁸⁸ There has been various scientific procedures to prepare drugs under hygienic conditions.⁸⁹ The Herbal Medicine Department of KNUST has been training

⁸² Ibid

⁸³ Dr Sam was recruited and worked at the Centre from 1993 and under his supervision as the Head of Phytochemistry and I.C.U. Department; tremendous additions were introduced at the center including bottling of drugs.

⁸⁴ Interview with Dr George Henry Sam at the Herbal Medicine Department (KNUST), 17th May 2018.

⁸⁵ Interview with Mrs Adelaide Acheampong at the Manhyia District Hospital's D.D.N.S Office, 24th April 2018

⁸⁶ Ibid

⁸⁷ Interview with Dr Kwasi Yeboah-Awudzi at the Ashanti regional Directorate, 9th April 2018

⁸⁸ Interview with Dr George Henry Sam at the Department of Herbal Medicine (KNUST), 17th May 2018.

⁸⁹ Interview with Dr Stephen Y. Gbedema at the Department of Herbal Medicine (KNUST), 18th May 2018.

both local herbal practitioners and students to better the approach in administering traditional medicine to patients and has been responsible for the springing up of 19 pilot herbal clinics.⁹⁰

Again, scientific medicine has improved childbirth especially after the year 2000.⁹¹ It has decreased infant-mother mortality and improved intensive child healthcare.⁹² As compared to traditional medicine and practice, the introduction of scientific medicine has contributed a lot in the area of midwifery than traditional birth attendants.⁹³ This is in contrast with existing literature that shows how the extent of collaboration between Traditional Birth Attendants and orthodox practitioners aided delivery and care in rural areas and the populations that is largely outside the cities and the urban regions of Ghana.⁹⁴

A follow up question required respondents to justify why they think one branch of medicine has made an impact than the other. The respondents indicated that they acknowledge that scientific medicine has contributed immensely and still improving but the impact of traditional medicine to the best of their knowledge cannot be underestimated. Most participants indicated that scientific medicine has contributed to the prevention and eradication of some killer disease that were prevalent in Africa some time ago. They also indicated that there have been improvements in the preparation of scientific medicine as compared to traditional medicine. They stressed on the notion that practitioners who produce herbal medicine mostly have less knowledge of scientific and hygienic methods but rather use their own conventional wisdom and gifts from their ancestors.

Participants also indicated there are little or no records or documentation on the effectiveness and efficacy of traditional medicine. This makes it very difficult to do a proper comparison.

4.2.1 Knowledge about the Nature of the Health Sector and the Standard of Science and Technology in the 1960s

Since the study is a comparative study that looks at the health care sector retrospectively from the 1960s, respondents were asked to indicate if they had knowledge about the nature of health sector and the standard of science and technology during the 1960s. Table 1.3 shows the summary of response from the field.

Table 1.3: Position of Respondents Concerning their Knowledge of Health Sectors and the Standards of Science and Technology in the 1960s

Knowledge about the Nature of the Health Sector in the 1960		
	Frequency	Percentage
Yes	33	80.5
No	8	19.5
Total	41	100.0
Standard of Science and Technology in the health Sector during the 1960		

⁹⁰ Op.cit

⁹¹ Interview with Mrs Abedua Billson via phone call on 9th May 2018

⁹² Ibid

⁹³ Ibid

⁹⁴ Adu-Gyamfi, Samuel, Razak Mohammed Gyasi, and Bennard Adubofour Poku. "Women Assisting Women in a Village in Ghana: The Role of Traditional Birth Attendants in Wurubegu-Anansu." *International Journal of Body, Mind and Culture* 5, no. 1 (2018): 46-60.

Low	26	63.4
Average	7	17.1
High	0	0.0
Not Applicable	8	19.5
Total	41	100.0

From Table 1.3, 33 respondents which represent 80.5% of the study participants indicated that, they are familiar and have an in-depth knowledge about the nature of the health sector during the 1960s whilst the remaining 16.5% indicated they were not familiar with the nature of the sector in the 1960s.

The study further asked respondents who indicated having knowledge about the health sector in the 1960s to rate the standard of science and technological advancement in the health sector then. The results as indicated in Table 1.3 show that, 63.4% of the respondents, which represents significant majority, hinted that the standard of science and technology in the health sector was low during the 1960s. Only 17.1% of respondents indicated that the standard of science and technology was average as compared to the current state of technology in our hospitals.

4.2.2 Improvement in the health Sector since 2000s as Compared to the 1990s.

Respondents were asked to indicate how the health sector has improved since the 2000s as compared to the period between 1960s and 1990s. Respondents recounted that the health sector has experienced several improvements with the help of science and technology. The areas include; improved skills (surgical skills), introduction of social welfare units, improved medication for various diseases and improved diagnostic equipment among others.

Most participants indicated that they have witnessed improvement in surgical skills among health professionals. Participants indicated that the skills of health professionals in all fields have increased to meet the complex health needs of patients especially in the area of surgery. Participants also hinted that, since the 2000s much emphasis has been placed on meeting the social and emotional healthcare needs of patients and as a result, management of various hospitals have introduced social welfare units. Skilled and trained medical social workers have helped the medical team to meet the social and emotional needs of patients in the social welfare units. A participant from the KNUST Hospital indicated that the hospital recently established a welfare unit because of the growing demand for social workers support and assistance.

Participants of the study indicated that they have improved medication for various types of diseases that were previously thought to have been incurable. Preparation of medication has been improved to treat various types of diseases. The efficacy and effectiveness of diseases have been improved drastically over the past decades through research and from practical learning. Also, participants of the study indicated that there have been recent increases in knowledge and equipment for diagnosis that have aided the early detection of some diseases before they reached their advanced and deadly stage. Previously, certain diseases were not easily detected unless it reached some stages in their development but participants indicated that through advancement in science and technology in the health sector they are easily detectable. One of our interviewees hinted that all these have been improved with the introduction of

advanced equipment like MRI Scanners and the Electrocardiography (ECG) machine which has greatly improved health care and catalysed healthcare delivery.⁹⁵

4.2.3 Level of Specialization among the Human Resource in the Health Sector

Respondents were asked to indicate if the level of specialization of health professionals corresponds with the health care needs of patients. Results from the field indicated that human resource in the health sector matches the demand and the general needs of patients. However, some respondents indicated that the current human resource and the level of expertise do not meet the health demand of patients. Respondents who indicated 'NO' explained that the number of patients far outnumber the health professionals available to offer professional support. Respondents further indicated that Ghana's health sector is lagging behind in terms of care which is driven by science and technology. They argued among other things that there are new and more improved medical facilities that could be built and equipment that could have been bought to equip the existing hospitals. At the time of the field interview in March, 2018, our informant made reference to the need to add drones to the healthcare system of Ghana as found in some first world countries like Germany where these drones are equipped with first aid kits to enable facilitation of First Aid to patients before being conveyed to the hospital for further treatment.⁹⁶ Recently, the Government of Ghana has introduced medical drones to the Ghana Health Service. On Monday, 23rd April 2018, in the presence of Vice President of the Republic of Ghana, Dr Mahamudu Bawumia, who has championed efforts to ensure the use of innovation and technology in public service delivery; a deputy Minister of Health, Tina Mensah, signed on behalf of Ghana while Keller Rinaudo, CEO of Zipline, signed for his company in Accra a letter of intent to produce medical drones to supply essential healthcare products to hospitals and other health facilities to leverage technology to improve the supply chain of critical medical supplies, reduce waste and save lives in Ghana.⁹⁷ On 24th April 2019, the Vice President of the Republic of Ghana, Dr Mamahudu Bawumia launched the first ever medical drone delivery service in Ghana at Omenako, near Suhum, in the Eastern Region.⁹⁸ The "dronefication" of Ghana's healthcare has come with a lot of debate. This notwithstanding, it is envisaged that it would contribute to the advances the health sector of Ghana has made over time. This fly to save life project has been lauded by several people including, the Microsoft co-founder, Bill Gates who has shown keen interest concerning health and poverty issues in Africa.⁹⁹ In traditional medicine sector, an expert informant was optimistic that the gradual training of practitioners through infusion of scientific knowledge with traditional medicine practices will produce a generation of competent practitioners and doctors in the health sector of Ghana.¹⁰⁰

4.2.4 Ghana's Preparedness to Embrace Scientific Innovation in the Health Sector

Respondents were asked to indicate the extent to which they agree that Ghanaian health professionals are prepared to embrace science and technological innovation that have spread in western countries. Summary of responses from the field as shown in Table 1.4 indicates that majority (70.7%) of respondents strongly

⁹⁵ Interview with Mrs Adelaide Acheampong at the Manhyia District Hospital's D.D.N.S Office, 24th April 2018

⁹⁶ Interview with Mr Asante at St John's Ambulance Kumasi branch office, 19th March

⁹⁷ Ghana Health Service. Ministry of Health signs MoU to deploy drone technology for efficient health delivery, <https://www.ghanhealthservice.org/ghs-item-details.php?scid=22&iid=138>, 04/05/2019.

⁹⁸ World's largest medical drone delivery service takes off in Ghana. <https://www.ghanaweb.com/GhanaHomePage/NewsArchive/World-s-largest-medical-drone-delivery-service-takes-off-in-Ghana-741285>, 04/05/2019

⁹⁹ Bill Gates lauds Ghana's medical drone delivery project. <https://www.ghanaweb.com/GhanaHomePage/NewsArchive/Bill-Gates-lauds-Ghana-s-medical-drone-delivery-project-742851>, 04/05/2019

¹⁰⁰ Interview with Dr Stephen Y. Gbedema at the Department of Herbal Medicine (KNUST), 18th May 2018.

agree that professionals in the Ghana health Sector are adequately prepared to accept and handle the scientific innovation in the health care sector. However, 4.9% of respondents were not sure whether Ghana is prepared to embrace the scientific and technological innovations from the advanced world. They hinted that, some professionals lack the technical expertise to handle some advanced innovations.

Table 1.4: Positions of Respondents Concerning Ghana's Preparedness to embrace Scientific Innovation in the Health Care Sector

	Frequency	Percentage
Strongly Agree	29	70.7
Agree	10	24.4
Neutral	2	4.9
Disagree	0	0.0
Strongly Disagree	0	0.0
Total	41	100.0

Also, most interviewees agree to the fact that Ghana is prepared to handle scientific and technological innovations to tackle epidemics, including research to improve the standard of living of Ghanaians. This is due to the seriousness successive governments of Ghana attached to the health sector; in terms of improving the healthcare systems especially at the tertiary level to equip the human resource to match up with new technologies.

5.0 Conclusion

From this study, it can be argued that, the Ghana health sector is and will improve through science and technological innovations. Currently, Ghana continues to witness innovations in the area of eHealth Solutions launched in 2010, medical drones in 2019, aimed at supplying essential medical needs to facilitate and ensure effective and safe healthcare for Ghanaians, the training of health professionals with cutting-edge skills in the area of drug research, laboratory training, specialist training in the area of Oncology, heart surgery among others show the growing capacity of Ghana's healthcare now and what it can achieve in the foreseeable future. The study has shown that traditional medicine has seen improvements through advances in science and technology, hence, complementing the orthodox system of healthcare delivery in Ghana. It can be surmised that the continuous advancement in scientific research in traditional medicine in particular would lessen the bold lines between practitioners of same and those of the orthodox class. The study results have shown that over the period, improved facilities and advances in science and technology have supported hospital care and primary healthcare for patients who visit the hospitals. However, it is also clear that the Ghana Health Service must continue to improve upon its strategies and embrace new technologies to support treatment and ensure efficiency in the health sector.

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