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Status of Emerging Technologies Required for Sustainable Development Goals (SDGs) in the Promotion of Public Health in Enugu State.

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ABSTRACT

The study examined the status of emerging technologies required for Sustainable Development Goals (SDGs) in the promotion of public health in Enugu state. This study was guided by two research questions and two null hypotheses. The researchers utilized a descriptive survey research design for the study. The population for the study was 570 public health officers (145 males and 425 females) in Enugu State. There was no sampling because the population was manageable. The instrument for data collection was a 16-item structured questionnaire titled "Status of Emerging Technologies Required for SDGs in the Promotion of Public Health Questionnaire (SETSDGsPPHsQ)". The instrument was validated by three research experts. To ascertain the internal consistency of the instrument, Cronbach Alpha method was used to compute the internal consistency of the instrument. The computation yielded 0.78 and 0.80 for clusters 1 and 2 respectively. The instrument had an overall reliability index of 0.79 which indicates that the instrument is reliable. Mean and standard deviation were used for answering the research questions while the hypotheses were tested with t-test statistic. The findings of the study revealed the status of emerging technologies requirements for Sustainable Development Goals (SDGs) in the promotion of remote patient monitoring is insufficient. Based on the findings of the study, the researcher recommended that there should be adequate provision of emerging technologies tools like laptops, software, among others through which effective promotion of remote patient monitoring can be achieved.

Keywords: Emerging Technologies, Sustainable Development Goals (SDGs), Public Health

INTRODUCTION

The pursuit of Sustainable Development Goals (SDGs) has become a global priority, seeking to address pressing social, economic, and environmental challenges. The Sustainable Development Goals (SDGs) are a set of seventeen global objectives designed as a roadmap to create a better and more sustainable future for everyone. These goals are intended to be achieved by 2030, in every country worldwide (United Nations, 2021). The vision behind the SDGs includes creating a world free from poverty, hunger, disease, and deprivation, where life can flourish, and fear and violence are eradicated. The goals aim to promote universal literacy and ensure equitable and accessible quality education at all levels. They also seek to provide comprehensive healthcare and social protection, ensuring physical, mental, and social well-being for all. Another crucial aspect of the SDGs is their focus on upholding human rights, human dignity, and the principles of justice, equality, and non-discrimination. They also advocate for respect for racial, ethnic, and cultural diversity, fostering equal opportunities that enable the realization of human potential and contribute to shared prosperity (United Nations, 2021).

The most intriguing feature of sustainable development is its consideration of present needs without compromising the needs of

future generations. This concept makes sustainable national development the modern yardstick for measuring progress and growth (Chigbu, Oguzie and Obi, 2020). Among the seventeen SDGs adopted by the United Nations, Goal 3 specifically focuses on ensuring healthy lives and promoting well-being for all at all ages. Health holds utmost importance for individuals, communities, and entire nations (Ngwu and Ekpiken-Ekanem, 2017). According to the World Health Organization (2013), being healthy entails the ability to breathe freely, fulfill one's needs, and effectively interacts with and adapt to the environment. Public health is a crucial aspect of achieving this goal, and the strategic integration of emerging technologies plays a pivotal role in bolstering healthcare systems and advancing healthcare delivery.

Emerging technologies refer to novel or developing advancements and innovations in various fields that have the potential to significantly impact societies, industries, and human life. Emerging technologies, as described by Bozalek (2015), are technologies that have the potential to significantly influence education, learning, and creative inquiry among learners. These technologies can be either in the process of development or are anticipated to become accessible in the next five to ten years. The term "emerging technologies" typically refers to those innovations that are likely to bring about substantial social or economic impacts. These technologies are typically in the early stages of research, development, and adoption, and they often have the capacity to revolutionize existing processes, create new opportunities, and address complex challenges. Bozalek (2015 further stated that emerging technologies can arise in various domains, such as information technology, biotechnology, nanotechnology, robotics, artificial intelligence, renewable energy, quantum computing, materials science, and more.

The incorporation of emerging technologies for health services is continuously increasing due to the advantages that technology offers to patients (Safavi and Kalis, 2018). People of all age groups are expressing interest in these services as they provide valuable information about diseases and medications without the need to visit a doctor. This convenience saves both time and energy for patients (Safavi and Kalis, 2018). Furthermore, emerging technologies benefit not only patients but also hospitals and health centers. These technologies enhance the efficiency of medical professionals, enabling them to provide online medical recommendations, thereby, increasing the number of patients they can assist in a day. World Health Organization (2019), stated that this approach also allows doctors to focus more on individuals requiring physical consultations.

The adoption of emerging technologies has brought about a significant transformation in the healthcare industry. As stated by Adeleke, Sunday, Ameenah, Tony, Oluseye and Danjuma (2014), emerging technologies have emerged as a fundamental element that enables the successful and efficient delivery of healthcare services. Meanwhile, emerging technologies in healthcare refer to novel and innovative tools, devices, systems, and approaches that have the potential to significantly impact the medical field. These technologies are typically in the early stages of development and adoption but show promise in improving patient care, enhancing medical processes, and advancing medical research (WHO, 2013). According to Halamka (2014), advancements in technology have revolutionized the healthcare sector, offering new possibilities for disease prevention, diagnosis, treatment, and health promotion. Key emerging technologies include artificial intelligence

(AI), telemedicine, blockchain, Internet of Things (IoT), genomics, and big data analytics. These technologies have shown immense promise in enhancing healthcare accessibility, affordability, and effectiveness.

Additionally, emerging technologies seems to be important in disease surveillance. Disease surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of health-related data to monitor and track the occurrence of diseases and health conditions within a population (Halamka, 2014). The primary objective of disease surveillance is to detect and respond to potential outbreaks or epidemics promptly, allowing for early intervention and control measures to minimize the impact on public health. Leveraging artificial intelligence and big data analytics, health authorities in Enugu State can analyze vast amounts of data from multiple sources to identify disease outbreaks, track trends, and implement timely interventions. Additionally, IoT-enabled devices can aid in real-time data collection, enabling better disease surveillance and resource allocation (Halamka, 2014). While disease surveillance focuses on monitoring and managing population health, remote patient monitoring concentrates on individual patient care.

Remote patient monitoring (RPM) is a healthcare practice that involves the use of technology to collect medical and health-related data from patients in one location (often their homes) and transmit that information securely to healthcare professionals in a different location (Omboni and Tenti, 2016). This allows healthcare providers to monitor and assess a patient's health status and vital signs without requiring them to be physically present in a healthcare facility.

Emerging technologies are rapidly reshaping the healthcare landscape, and their continued advancement holds the potential to revolutionize patient care, improve medical outcomes, and increase overall efficiency within the healthcare industry. Despite the potential benefits of technology, the successful integration of emerging technologies in Enugu State's public health sector faces several challenges. According to Edeh (2019), these include limited infrastructure, inadequate digital literacy, data security concerns, and financial constraints. Overcoming these obstacles requires collaborative efforts from the government, private sector, and healthcare professionals.

Healthcare professionals' gender has also been associated with the acceptance of technology. Gender is defined as a characteristic that distinguishes individuals based on their roles as either female or male in the context of reproduction (Abubakar and Uboh, 2010). Additionally, it represents a social and cultural construct associated with being male or female. According to Yang (2010), gender is a social attribute that connects both males and females. Emerging technologies in healthcare, such as telemedicine and mobile health applications, can greatly benefit public health. However, gender differences in technology access and literacy can affect women's ability to use these technologies, potentially exacerbating existing healthcare disparities.

The status of emerging technologies for sustainable development goals in promoting public health in Enugu State holds immense promise. By capitalizing on the potential of these technologies, stakeholders can bridge the gaps in improve disease surveillance, remote patient monitoring and enhance the overall well-being of the population. Embracing these innovations with careful consideration of the challenges can lead Enugu State towards a more resilient and

sustainable healthcare system, aligned with the global pursuit of SDG 3. Enugu State, located in Nigeria, faces a myriad of public health challenges, ranging from infectious diseases to non-communicable diseases, inadequate healthcare infrastructure, and unequal access to quality healthcare services. To address these issues and accelerate progress towards SDG 3, the state must embrace innovative and emerging technologies. It is based on the above premise that the present study examined the status of emerging technologies required for Sustainable Development Goals (SDGs) in the Promotion of Public Health in Enugu State.

Statement of the Problem

In Enugu State, the promotion of public health is a critical concern for sustainable development, especially with the increasing emphasis on achieving the United Nations' Sustainable Development Goals (SDGs). These global goals address various social, economic, and environmental challenges, including those related to health and well-being. The successful integration and utilization of emerging technologies play a pivotal role in accelerating progress towards achieving the SDGs in the context of public health. Despite the growing recognition of the potential of emerging technologies in improving healthcare and public health outcomes, their current status and effective implementation in Enugu State remain largely unexplored. Enugu State faces several public health challenges, including high prevalence rates of infectious diseases, inadequate healthcare infrastructure, and limited access to quality medical services in remote areas. The state needs to leverage emerging technologies effectively to improve healthcare delivery and achieve the SDGs related to disease surveillance in the promotion of public health and remote patient monitoring in Enugu State. The problem of the study when put in a question form becomes "What is the status of emerging technologies required for Sustainable Development Goals (SDGs) in the promotion of public health in Enugu State?

Purpose of the Study

The purpose of the study was to ascertain the status of emerging technologies required for Sustainable Development Goals (SDGs) in the Promotion of Public Health in Enugu State. Specifically, the study sought to:

1. examine the status of emerging technologies in disease surveillance in the promotion of public health in Enugu State;
2. ascertain the status of emerging technologies in remote patient monitoring in the promotion of public health in Enugu State.

Research Questions

The following research questions guided the study:

1. What is the status of emerging technologies in disease surveillance in the promotion of public health in Enugu State?
2. What is the status of emerging technologies in remote patient monitoring in the promotion of public health in Enugu State?

Hypotheses

The following hypotheses were formulated and tested at .05 level of significance;

Ho_1: There is no significant difference in the mean ratings between male and female public health officers in the status of emerging technologies in disease surveillance in the promotion of public health in Enugu State.

Ho_2: There is no significant difference in the mean ratings between male and female public health officers in the status of emerging technologies in remote patient monitoring in the promotion of public health in Enugu State.

Research Method

The research employed a descriptive survey research design, a methodology that allows for the examination of a selected sample from the target population, enabling inferences and generalizations about the entire population (Nworgu, 2018). The study focused on 570 public health officers (comprising 145 males and 425 females) in Enugu State. Since the population size was manageable, there was no need for sampling. Data collection utilized a 16-item structured questionnaire called "Status of Emerging Technologies Required for SDGs in the Promotion of Public Health Questionnaire (SETSDGsPPHsQ)." The questionnaire was validated by three research experts, two from the Department of Human Kinetics and Health Education and one from the Department of Mathematics and Computer Education, all affiliated with the Faculty of Education at Enugu State University of Science and Technology.

To assess the instrument's internal consistency, the Cronbach Alpha method was used, yielding reliability coefficients of .78 and .80 for clusters 1 and 2, respectively. The overall reliability index of the instrument was calculated to be .79, indicating its reliability. For addressing the research questions, mean and standard deviation were utilized, while hypotheses were tested using the t-test statistic. When evaluating the average score, we used specific numerical intervals based on actual numeric boundaries for each response option: Strongly Agree (SA) fell within the range of 3.50 to 4.00; Agree (A) fell within 2.50 to 3.49; Strongly Disagree (SD) ranged from 1.50 to 2.49; and Disagree (D) ranged from 0.00 to 1.49. The assessment of hypotheses involved analyzing the significance (sig.) values from the SPSS output. If the probability values were greater than .05, we retained the null hypothesis; if they were less than .05, we rejected the null hypothesis.

Data Analysis and Results

Research Question 1: What is the status of emerging technologies in disease surveillance in the promotion of public health in Enugu State?

Table 1: Mean ratings of public health officers on the status of emerging technologies in disease surveillance in the promotion of public health in Enugu State

	ITEMS	Male - 145			Female - 425		
S/N	**The following status of emerging technologies in disease surveillance are that:**	$\bar{x}$	**SD**	**Dec**	$\bar{x}$	**SD**	**Dec**
1.	using Geographic Information Systems (GIS) tools to map disease outbreaks.	1.98	.82	D	1.91	.81	D
2.	using the advances in genomics for more precise monitoring of infectious diseases by tracking their genetic sequences.	1.97	.88	D	1.90	.80	D
3.	using mobile applications for real-time data collection and reporting of disease cases.	1.94	.84	D	1.93	.81	D

4.	when IoT device, such as wearable health trackers provide continuous health data to authorities for early detection of potential outbreaks.	1.98	.87	D	1.97	.81	D
5.	blockchain is regularly use to enhance data security.	1.91	.84	D	1.99	.82	D
	Cluster Mean/SD	**1.96**	**.85**	**D**	**1.94**	**.81**	**D**

The data presented in Table 1 illustrates the mean ratings and standard deviations related to the state of emerging technologies in disease surveillance, specifically in promoting public health in Enugu State. According to the table, respondents expressed their disagreement with items 1, 2, 3, 4 and 5 for both male and female public health officers. Furthermore, Table 1 demonstrates that the cluster mean, which is calculated as the overall average across all items, is 1.96 for male and 1.94 for female respectively with an average of 1.95. Additionally, the cluster standard deviations are recorded as .85 and .81. Based on these statistics, it can be inferred that the current status of emerging technologies for enhancing disease surveillance in promoting public health in Enugu State is deemed insufficient in Enugu State.

Research Question 2: What is the status of emerging technologies requirements for Sustainable Development Goals (SDGs) in remote patient monitoring in Enugu State?

Table 2: Mean ratings of public health officers on the status of emerging technologies requirements for Sustainable Development Goals (SDGs) in remote patient monitoring

	ITEMS	**Male - 145**			**Female - 425**		
S/N	**The following status of emerging technologies are that:**	$\bar{x}$	**SD**	**Dec**	$\bar{x}$	**SD**	**Dec**
6.	data collection.	1.55	.82	D	1.47	.86	D
7.	data sensors.	1.44	.84	D	1.56	.84	D
8.	telemedicine integration.	1.54	.83	D	1.54	.86	D
9.	patient engagement.	1.48	.84	D	1.47	.83	D
10.	clinical trials.	1.50	.83	D	1.55	.82	D
	Cluster Mean/SD	**1.50**	**.83**	**D**	**1.52**	**.84**	**D**

The data presented in Table 2 illustrates the average scores and standard deviations regarding the status of emerging technologies requirements for Sustainable Development Goals (SDGs) in remote patient monitoring in Enugu State. The respondents expressed disagreement with items 6, 7, 8, 9 and 10 as indicated by their

mean ratings. Moreover, Table 2 shows cluster means of 1.50 and 1.52, along with cluster standard deviations of .83 and ,84 respectively. These findings collectively suggest that the current status of emerging technologies requirements for SDGs in remote patient monitoring in Enugu State is inadequate.

Ho_1: There is no significant difference in the mean ratings between meal and female public health officers in the status of emerging technologies in disease surveillance in the promotion of public health in Enugu State.

Table 3: Summary of t-test analysis on the mean ratings of male and female public healthcare officers in the status of emerging technologies in disease surveillance in the promotion of public health in Enugu State

Group	n	$\overline{x}$	SD	df	Level of Sig	P-value	Decision
Male	145	1.96	.85	568	.05	.098	Ho1 not rejected
Female	425	1.94	.81				

The data shown in Table 3 pertains to male and female public health officers. With 568 degrees of freedom, the computed p-value was .098. This p-value surpasses the chosen significance level of .05 for the study. As a result, we can infer that there is no statistically significant distinction in the average ratings between male and female public health officers concerning the role of emerging technologies in disease control and the promotion of public health in Enugu State.

Ho_2: There is no significant difference in the mean ratings between meal and female public health officers in the status of emerging technologies requirements for Sustainable Development Goals (SDGs) in remote patient monitoring in Enugu State.

Table 4: Summary of t-test analysis on the mean ratings of male and female public healthcare officers in the status of emerging technologies requirements for Sustainable Development Goals (SDGs) in remote patient monitoring in Enugu State

Group	n	$\overline{x}$	SD	df	Level of Sig	P-value	Decision
Male	145	1.50	.83	568	.05	.091	Ho2 not rejected
Female	425	1.52	.84				

The information presented in Table 4 regarding male and female public health officers indicates that at 568 degrees of freedom, the calculated p-value was .091. This p-value exceeds the significance level of .05, which was set for the study.

Therefore, it can be concluded that there is no statistically significant difference in the mean ratings of male and female public health officers concerning the status of emerging technologies requirements for Sustainable Development Goals (SDGs) in remote patient monitoring in Enugu State.

Discussion of Findings

The current status of emerging technologies for enhancing disease surveillance and promoting public health in Enugu State is deemed insufficient. There is no statistically significant distinction in the average ratings between male and female public health officers concerning the role of emerging technologies in disease control and the promotion of public health in Enugu State.

The current status of emerging technologies requirements for SDGs in remote patient monitoring is inadequate. The finding of the study is in line with Adeleke et al, (2014), who posited that most countries in the sub Saharan region are still finding it difficult to fully integrate emerging technologies in the healthcare sector. The hypothesis tested showed that there is no statistically significant difference in the mean ratings of male and female public health officers concerning the status of emerging technologies requirements for Sustainable Development Goals (SDGs) in the promotion of remote patient monitoring in Enugu State.

Conclusion

The promotion of public health through the integration of emerging technologies is a crucial aspect of achieving the Sustainable Development Goals (SDGs) in Enugu State, as well as globally. Several emerging technologies have shown great promise in addressing public health challenges, improving healthcare delivery, and enhancing the overall well-being of communities. However, the findings revealed that the status of emerging technologies required and in disease surveillance and remote patient monitoring in the promotion of public health in Enugu State are still insufficient in Enugu State public health sector.

Recommendations

The following recommendations were proffered for this study:

1. The state government should allocate funds and resources to develop and improve the technology infrastructure in the public health sector in order to improve the remote patient monitoring. This includes upgrading hardware, software, and network capabilities to support data collection, storage, and analysis.
2. Non-governmental organizations should provide training programmes for public health workers on how to effectively use emerging technologies for disease surveillance. This will ensure that the workforce is equipped with the necessary skills to leverage these tools to their full potential.

REFERENCES

Abubakar, R.B. & Uboh, V. (2010). Breaking the gender barrier in enrolment and academic achievement of Science and Mathematics students. *Akoka Journal of Pure and Applied Science Education*, 10(1), 203-213.

Adeleke, I.T., Sunday, A.E., Ameenah, M.N., Tony, C.A., Oluseye, A.O., & Danjuma, A. (2014). "Health Information Technology in Nigeria: Stakeholders' Perspectives of Nationwide Implementations and Meaningful Use of the Emerging Technology in the Most Populous Black Nation." *American Journal of Health Research* 3 (1–1): 17–24.

Bozalek, V. (2014). An investigation into the use of emerging technologies to transform teaching and learning across differently positioned higher education institutions in South Africa. In G. Williams, P. Statham, N. Brown, & B. Cleland (Ed.), *Changing Demands, Changing Directions Proceedings ascilite* (156-161).

Chigbu, E.F., Oguzie, A.E., & Obi, J.S. (2020). Counselling: an advocacy for balancing gender disparity for sustainable national development. *Sapinta Global Journal of Arts, Humanity and Development Studies, 3*(2), 88-99.

Edeh, M.O. (2019). Integration of emerging technologies in teaching and learning process in Nigeria: the challenges. *Central Asian Journal of Mathematical Theory and Computer Sciences, 1*(1), 35-39.

Leedy, P.D. & Ormrod, J.E. (2013). Practical Research: Planning and Design. 10th Edition, Merrill/Prentice Hall, Boston.

Ngwu, U.I., & Ekpiken-Ekanem, R. (2017). Evaluating the impact of health education on health knowledge: a study of secondary school students in Cross River State, Nigeria. *International Journal of Humanities & Social Science: Insights & Transformations*, 3(1), 36-44.

Nworgu, B.G. (2018). *Educational research, basic issues and methodology*. University Trust Publishers Nsukka, Nigeria.

Omboni, S., & Tenti, M. (2016). Remote patient monitoring in hypertension management: an update. Patient Preference and Adherence, 10, 713-725.

Safavi, K. & Kalis, B. (2018). *Consumers are plugged in. [Online]*. Available at: https://www.accenture.com/us-en/insight-new-2018-consumer-survey-digital-health [Accessed 2020- 01-21]

United Nations (2021). Transforming our world: the 2030 *Agenda for Sustainable Development*. Retrieved from https//: sustainabledevelopment.un.org.

World Health Organization (2013). WHO MIND - Mental Health in development. WHO. *Available from URL: http://www.who.int/mental_health/policy/en/* (Accessed 15 July 2013).

World Health Organization (WHO). (2019). What you need to know about digital health systems. [Online]. *Available at: http://www.euro.who.int/en/health-topics/Healthsystems/pages/news/news/2019/2/what-you-need-to-know-about-digital-health-systems [Accessed 2020-01-21]*

Yang, Y.C. (2010). Gender differences in adolescents' online shopping motivations. *African Journal of Business Management 4*(6), 849-857