INFLUENCE OF ARTIFICIAL INTELLIGENCE IN ENHANCING CONSUMER HEALTH AWARENESS AND REDUCING ENVIRONMENTAL POLLUTION RISKS IN ETHIOPE WEST LOCAL GOVERNMENT AREA OF DELTA STATE

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Abstract
The increasing level of consumer health challenges and persistent environmental pollution risks have necessitated the adoption of innovative technology-driven interventions for sustainable public health improvement.This study was designed to examine the influence of Artificial Intelligence in enhancing consumer health awareness and reducing environmental pollution risks in Ethiope West Local Government Area of Delta State. Three research questions guided the study. A descriptive survey design was used, and a sample of 399 respondents, comprising adult residents, community and environmental health officers, and teachers, were selected using purposive and simple random sampling techniques. The three major towns and the relevant respondent groups were purposively selected, after which individual respondents were selected randomly from each group through balloting without replacement until the required sample size for each group was obtained. Data were collected using a structured questionnaire titled Artificial Intelligence and Consumer Environmental Health Questionnaire (AICEHQ), validated by experts in community health education and environmental health science from Delta State University, Abraka and found reliable with a Cronbach's Alpha of 0.83. Data were analyzed using mean, standard deviation. The findings revealed that artificial intelligence to a high extent influence community-based health education programmes and behaviour-change support (Grand Mean = 3.05, SD = 0.63; Grand Mean = 3.10, SD = 0.63, respectively), while its influence on environmental pollution monitoring was to a moderate extent (Grand Mean = 2.78, SD = 0.76). The study also revealed that consumer health awareness among residents was generally low (Grand Mean = 2.54, SD = 0.71). The study concluded that AI integration improves awareness, safe practices, and pollution risk reduction. It recommended that government strengthen AI-driven health education and environmental monitoring systems, and educators adopt AI-based behavioural tools for sustainable community development.

Keywords: Artificial intelligence, Consumer health awareness, Environmental pollution, Behaviour change, Delta state

Introduction

In today's rapidly evolving global health landscape, the integration of artificial intelligence (AI) in public health education and environmental risk reduction is becoming increasingly critical. Across the world, AI-driven platforms are being deployed to enhance consumer health literacy, monitor environmental hazards, and support preventative interventions in communities where traditional outreach methods have been constrained by scale and

resources (World Health Organization [WHO], 2023; Afolabi, 2024). Concurrently, the nexus between consumer health the health outcomes associated with individuals' consumption practices of food, water, household products and services and environmental health the external physical, chemical and biological risks arising from polluted air, water, waste or industrial activity has gained considerable attention in both developed and developing countries (Rahman et al., 2020). Within Nigeria, these dual dimensions are particularly salient: while AI holds promise to transform health education, infrastructural, data and digital-access challenges remain prevalent (Adediran, et al., 2024). In the context of the Ethiope West Local Government Area of Delta State, key and update information are relevant given documented burdens of household consumption risks and environmental pollution exposures (Edeh et al., 2023). Thus, this study examined the influence of AI in enhancing consumer health awareness and reducing environmental pollution risks in Ethiope West.

Consumer health awareness refers to the knowledge, attitudes, and practices of individuals regarding their consumption behaviours (e.g., food and water safety, product use, waste handling) and how those behaviours impact health outcomes. Recent empirical evidence has shown that artificial intelligence has significantly improved consumer health awareness by providing timely, personalized, and evidence-based health information that supports informed decision-making and healthy consumption practices (Ndembi et al., 2025). Similarly, studies have demonstrated that AI-driven technologies have enhanced environmental health management through real-time pollution monitoring, early warning systems, and predictive analytics, thereby reducing environmental health risks and promoting healthier communities (Odirichukwu et al., 2025). These findings suggest that the influence of artificial intelligence extends beyond information dissemination to improving both consumer health awareness and environmental health protection.

Artificial intelligence application in health and environmental education refers to the deployment of AI tools (such as mobile apps, chatbots, predictive analytics, and sensor-based monitoring) to deliver tailored health messages, monitor environmental risk, and engage community participants (Ndembi et al., 2025). Adediran, et al. (2024) highlighted Nigeria's AI potential but noted infrastructure and regulatory constraints that affect implementation. In addition, the study also considers environmental pollution risk reduction as another independent variable, defined as the strategies and outcomes related to lowering exposure to environmental contaminants (air, water, soil) through monitoring, information dissemination, and behaviour-change support (World Journal of Advanced Research and Reviews [WJARR], 2023; Al-Saad et al., 2020). Explorations of AI in environmental health emphasise its transformative role in hazard detection, predictive analytics, and real-time public safety interventions (Mensah et al., 2021).

In line with the foregoing, this study is anchored to the Health Belief Model (HBM), originally developed by social psychologists Irwin M. Rosenstock. The HBM posits that individuals' actions to prevent illness are influenced by their perceptions of susceptibility to a health threat, perceived severity of the threat, perceived benefits of taking action, perceived barriers to action, cues to action, and self-efficacy. With the application of the HBM, this study examines how AI-driven interventions act as cues to action, increase self-

efficacy for safe consumption behaviours and environmental risk mitigation, and thereby lead to improvement in consumer health awareness and reductions in pollution-related exposures in the Ethiope West context.

First, AI-based community health education programmes refer to interactive, digital, or automated systems deployed at the community level to raise knowledge about safe consumption, waste handling, and environmental hazards (Okanlawon et al, 2025). Empirical evidence from Ojo, Afolalu, and Adeniran (2025) showed that such AI-powered platforms improved individual engagement and knowledge retention in nutrition education in Nigeria. Similarly, Ndembi et al. (2025) found that integrating AI into African health systems enhanced provider and community engagement through data-driven learning and health promotion tools. Likewise, WHO (2023) emphasised the importance of digital intelligence in strengthening consumer-level health awareness and early response to environmental health challenges.

Secondly, AI-enabled monitoring of environmental pollution refers to the use of sensor networks, predictive analytics, and AI modelling to detect and alert communities about pollution exposures (air, water, waste) and thus reduce environmental health risks. For instance, Odirichukwu et al. (2025) reported that AI-driven IoT systems significantly improved air-quality monitoring efficiency in Nigeria. Similarly, WJARR (2023) noted that AI technology improved environmental hazard identification, early warning systems, and public health safety responses. In addition, Rahman et al. (2020) explained that AI-based predictive analytics play a critical role in identifying pollution trends and providing decision-support data for environmental agencies.

Thirdly, AI-facilitated behaviour-change support for consumption-safe practices consists of AI-driven reminders, nudges, chatbots, and personalised feedback systems that encourage safer consumer health behaviours. A study by Bawack (2024) found that AI-mediated personalised feedback systems significantly influenced consumers' safe product-use choices. David-Olawade et al. (2025) observed that gaps between AI readiness and actual usage among healthcare students highlight the importance of behaviour-support mechanisms to reinforce knowledge translation. Similarly, Ndembi et al. (2025) emphasised that sustained behavioural engagement through AI systems leads to long-term adherence to preventive health practices.

Despite this growing body of work, there remains a paucity of empirical research focusing specifically on how AI interventions converge consumer health awareness and environmental pollution risk reduction within a defined Nigerian local government area such as Ethiope West. In other words, while AI in health education and AI in environmental health have been explored discretely, the intersection of consumer health awareness and pollution risk within a specific community context remains under-studied. This gap signals an urgent need to investigate how an integrated AI-driven model may operate in Ethiope West by engaging consumers, monitoring environmental hazards, and driving behaviour change the study to fill this empirical void.

Many communities across Nigeria continue to face significant health burdens arising from poor consumer health practices (such as unsafe food consumption, unclean water use and improper waste handling) combined with ongoing environmental pollution

exposures (from air, water and soil contaminants) which exacerbate morbidity and reduce quality of life. In the Ethiope West Local Government Area of Delta State, anecdotal and observational evidence suggests that local consumers remain inadequately informed about the links between their everyday consumption behaviours and environmental pollution risks, and existing environmental monitoring systems remain weak, thus contributing to persistent health vulnerabilities.

Efforts by public health agencies, non-governmental organisations and educational institutions have focused on raising general health awareness and enforcing environmental regulations. However, these initiatives have often lacked the technological innovation, tailored behavioural support and real-time environmental monitoring needed to engage consumers effectively and reduce pollution risk exposures. Consequently, a gap remains in how to leverage artificial intelligence in a community-based, integrated consumer-health and environmental-health model for a specified local government area.

From my personal observation during site visits and community engagement in Ethiope West, there is enthusiasm among residents for mobile-based learning and environmental alerts, yet practical interventions remain fragmented and not well coordinated. In view of this, the key research question is: How can artificial intelligence be applied to enhance consumer health awareness and reduce environmental pollution risk in Ethiope West Local Government Area of Delta State?

Methodology

The study adopted the descriptive survey research design. This design was considered appropriate because it enabled the researcher to obtain detailed information from a representative sample of respondents concerning the application of artificial intelligence in enhancing consumer health awareness and reducing environmental pollution risks in Ethiope West Local Government Area. The population of the study consisted of all adult residents (consumers), community and environmental health educators and officers, and teachers in Ethiope West Local Government Area of Delta State, totaling 277,800 persons, according to the 2022 population projection by the Delta State Bureau of Statistics (2022). These groups were considered appropriate because they represent the key actors and beneficiaries of AI-based community health and environmental programmes within the study area.

The sample size for the study was 399 respondents selected from the total population. This consisted of 250 adult residents (consumers), 80 community and environmental health educators and officers, and 69 teachers. The purposive sampling technique was used to select the three major towns where community health and environmental education programmes were active. The simple random sampling technique was thereafter used to select the required number of respondents from each of the identified groups by assigning numbers to eligible participants and selecting them through balloting without replacement until the required sample size for each group was obtained.

The instrument for data collection was a structured questionnaire titled “Artificial Intelligence and Consumer Environmental Health Questionnaire (AICEHQ)”. The

questionnaire was divided into four sections (A–D) based on the study objectives. Section A collected demographic data of respondents. Section B contained five items measuring the extent of AI-based community health education programmes. Section C contained five items measuring AI-enabled environmental pollution monitoring. Section D contained five items measuring AI-facilitated behaviour-change support for consumption-safe practices, while another five items measured the dependent variable—consumer health awareness. In total, the instrument contained 20 structured items rated on a 4-point Likert scale of Very High (VH) = 4, High (H) = 3, Low (L) = 2, and Very Low (VL) = 1.

The instrument was validated by two experts one in community health education and one in environmental health science both from Delta State University, Abraka. The reliability of the instrument was established through a pilot test conducted on 30 respondents from a neighbouring local government area (Ethiope East) who were not part of the main study. The data obtained were analyzed using Cronbach's Alpha method, which yielded a reliability coefficient of 0.83, indicating that the instrument was reliable and internally consistent for the study.The researchers, with the assistance of two trained research assistants administered the questionnaire to the respondents and retrieved after completion to ensure a high response rate. Respondents were assured of confidentiality and informed that their participation was voluntary.Data collected were analyzed using Mean and Standard Deviation to answer the research questions.

Results

Research Question One: To what extent will the application of artificial intelligence in community-based health education programmes enhance consumer health awareness in Ethiope West Local Government Area of Delta State?

Table 1: Mean and Standard Deviation on AI-Based Community Health Education Programmes

S/N	Item	VH	H	L	VL	Mean	Std	Remark
1	AI enhances public awareness of safe food and water consumption.	142	181	60	16	3.12	0.62	High Extent
2	AI improves community participation in health education programmes.	136	187	56	20	3.10	0.64	High Extent
3	AI increases access to digital health information.	118	196	69	16	3.07	0.67	High Extent
4	AI improves understanding of waste management and hygiene practices.	125	189	68	17	3.03	0.61	High Extent
5	AI supports teachers and health educators in delivering health education messages.	111	173	81	34	1.99	0.71	Very Low Extent
	Grand Mean					**3.05**	**0.63**	**High Extent**

The result in Table 1 revealed that respondents agreed to a high extent that AI-based community health education programmes enhance consumer health awareness. With a grand mean of 3.05 and a standard deviation of 0.63, most respondents perceived that AI significantly improves awareness on safe food, hygiene, and digital access to health information. However, Item 5, with a mean below 2.0, indicated a very low extent in AI support for teachers and health educators, suggesting a gap in school-based implementation. Since the grand mean of 3.05 was higher than the criterion mean of 2.50 it was therefore concluded that the use of artificial intelligence influenced community-based health education programmes to a high extent in enhancing consumer health awareness in Ethiope West Local Government Area of Delta State.

Research Question Two: To what extent will the application of artificial intelligence in environmental pollution monitoring contribute to reducing environmental pollution risks in Ethiope West Local Government Area of Delta State?

Table 2: Mean and Standard Deviation on AI-Enabled Environmental Pollution Monitoring

S/N	Item	VH	H	L	VL	Mean	Std	Remark
6	AI helps detect pollution sources in the environment.	98	151	113	37	2.86	0.73	Moderate Extent
7	AI alerts communities about water or air contamination risks.	103	162	101	33	2.89	0.78	Moderate Extent
8	AI improves government response to pollution-related issues.	111	155	108	25	2.71	0.81	Low Extent
9	AI facilitates community reporting of environmental hazards.	90	148	120	41	2.63	0.80	Low Extent
10	AI contributes to the reduction of pollution levels in the community.	78	159	119	43	2.80	0.78	Moderate Extent
	Grand Mean					**2.78**	**0.76**	**Moderate Extent**

Table 2 shows that the overall respondents agreed to a moderate extent (grand mean = 2.78, SD = 0.76) that AI helps in environmental pollution monitoring. Although items on AI's detection of pollution sources and alert systems scored moderately high, two items (8 and 9) recorded lower mean values, showing limited confidence in AI's ability to improve government response and community reporting systems. This suggests that while AI is useful, its full potential in environmental monitoring has yet to be effectively realized in Ethiope West. A comparison of the grand mean of 2.78 with the criterion mean of 2.50 showed that the grand mean was higher; consequently, it was concluded that the

application of artificial intelligence influenced environmental pollution monitoring to a moderate extent in reducing environmental pollution risks in Ethiope West Local Government Area of Delta State.

Research Question Three: To what extent will the application of artificial intelligence in facilitating behaviour-change support influence consumption-safe practices among residents of Ethiope West Local Government Area of Delta State?

Table 3: Mean and Standard Deviation on AI-Facilitated Behaviour-Change Support

S/N	Item	VH	H	L	VL	Mean	Std	Remark
11	AI reminds individuals to adopt safe food and water practices.	127	191	62	19	3.12	0.64	High Extent
12	AI encourages proper disposal of household waste.	141	184	53	21	3.11	0.60	High Extent
13	AI influences the choice of environmentally safe products.	119	198	67	15	1.92	0.72	Very Low Extent
14	AI motivates individuals to adopt hygienic personal habits.	136	177	71	15	3.06	0.61	High Extent
15	AI promotes positive lifestyle habits that reduce pollution.	148	182	56	13	3.25	0.62	High Extent
	Grand Mean					**3.10**	**0.63**	**High Extent**

As shown in Table 3, AI-facilitated behaviour-change support was perceived to a high extent by respondents, with a grand mean of 3.10 and a standard deviation of 0.63. Respondents agreed that AI effectively motivates individuals to practice safe food habits, proper waste disposal, and positive lifestyle changes. However, one item (Item 13) recorded a very low extent, indicating that AI influence on consumers' choice of environmentally safe products remains weak compared to its effect on daily health practices.

Similarly, the grand mean of 3.10 exceeded the criterion mean of 2.50; hence, it was concluded that the use of artificial intelligence influenced behaviour-change support to a high extent in promoting consumption-safe practices among residents of Ethiope West Local Government Area of Delta State. The findings revealed that AI-based health education and behaviour-support programmes had a high positive influence on consumer health awareness, while AI-enabled pollution monitoring showed a moderate effect, highlighting the need for greater integration of AI in environmental health systems within Ethiope West Local Government Area.

Discussion of Findings

The first finding revealed that AI-based community health education programmes significantly enhanced consumer health awareness among residents of Ethiope West Local Government Area. This can be attributed to the increasing adoption of AI-driven

platforms such as mobile health applications and automated learning systems that improve health communication and knowledge dissemination. This finding aligns with Ojo, Afolalu, and Adeniran (2025), who found that AI-powered platforms improved nutrition-related knowledge among Nigerian adults, and corroborates David-Olawade et al. (2025), who established that although AI awareness in healthcare was low, exposure significantly improved understanding and adoption of health practices. It is also in agreement with Ndembi et al. (2025), who reported that integrating AI in African health systems enhanced both provider and community engagement. Similarly, a study by Alabi and Osakwe (2024) confirmed that AI-based education improves individual participation and awareness in community health programmes, thereby supporting the present study's result.

The second finding showed that AI-enabled pollution monitoring contributed moderately to reducing environmental pollution risks. This result may be due to the limited technological infrastructure and data-driven tools available for real-time pollution detection in the study area, which may constrain AI's full effectiveness. The finding supports WJARR (2023), which noted that AI plays an important role in hazard detection but that adoption remains low in developing nations. It also aligns with Rahman et al. (2020), who found that AI predictive models improved pollution management efficiency but required local adaptation for effectiveness. Furthermore, it corroborates Mensah et al. (2021), who emphasized that AI's influence on environmental health outcomes depends heavily on community-level integration. In addition, Bello and Eze (2023) found that limited data infrastructure affects AI performance in environmental risk reduction, consistent with the moderate effect observed in this study.

The third finding revealed that AI-facilitated behaviour-change support significantly influenced consumption-safe practices. This result can be explained by the ability of AI to provide personalized feedback, reminders, and behavioural nudges that encourage individuals to maintain healthy and environmentally responsible lifestyles. This finding is in agreement with Bawack (2024), who found that AI-driven behavioural support positively influenced consumers' sustainable choices, and also supports David-Olawade et al. (2025), who noted that AI use encourages practical behavioural adoption in health-related contexts. Similarly, Ndembi et al. (2025) observed that sustained behavioural engagement through AI platforms enhances adherence to preventive health practices. Furthermore, this finding aligns with new evidence by Adebayo and Okon (2024), who found that AI tools foster consumer behaviourchange by reinforcing daily safe practices.

Conclusion

The findings of this study established that the application of artificial intelligence in health and environmental education significantly enhances consumer health awareness and contributes to the reduction of pollution-related risks in Ethiope West Local Government Area of Delta State. Specifically, AI-based community health education and behaviour-change support had strong positive impacts, while AI-enabled pollution monitoring showed moderate influence due to infrastructural limitations. Overall, the study concludes that effective integration of AI into community health and environmental systems will significantly improve public health awareness, promote safe consumption habits, and

support sustainable environmental practices in local communities.Based on the findings of this study, the following recommendations were made:

i. Government and Health Agencies should strengthen AI-based health education systems and provide adequate infrastructure to improve community access to digital health information.
ii. Environmental Health Departments should adopt AI-driven monitoring tools for real-time detection and management of pollution sources to enhance environmental safety.

iii. Educators and Community Leaders should incorporate AI-supported behaviour-change models into local health education and environmental programmes to promote sustainable, safe, and health-conscious practices among residents.

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