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Exploring Artificial Intelligence Research in Public Health: Trends, Innovations, and Global Health Outcomes

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Abstract

The study investigates the usefulness of chatbots in addressing global health concerns and challenges. The global healthcare system is suffering from problems caused by overpopulation, the emergence of new diseases, and conflicts of interest together with the natural environment. Nowadays, Artificial Intelligence (AI) technologies assist healthcare systems in improving access to care, increasing operational efficiency, and achieving better health outcomes. This study examined key applications of AI in health such as early detection of diseases, personalized health planning, optimal use of health resources, and disease prevention through health technologies. It also discusses ethical issues in adopting AI, such as data privacy and health inequities when implementing advanced tools and new solutions. This study conducted a comprehensive bibliometric analysis of data from the Scopus and Web of Science (WOS) databases for the last 50 years (1973-2023). This study identifies the significant factors, thematic clusters and new trends in the field of AI-based public health research. Visual mapping methods were applied to reveal the international collaboration structure, identify the research centers and thematic clusters related to disease management, psychological assistance, and public health policy. The results show that global health researchers need to coordinate multi-disciplinary interactions, set up ethical standards and develop concrete policies to promote the smooth integration of AI into public health. AI can have enormous impact on world health with novel and cost-effective healthcare solutions.

Keyword: Healthcare Technology, Health Informatics, Disease Prediction, Responsible AI Integration, Disease Prevention.

Introduction

In recent years, the combination of rapidly increasing data volumes, advances in machine learning, and the development of generative AI has changed public health from a reactive to a predictive and personalised form of care. The application of artificial intelligence in the field of public health has now moved on from being used mainly in research, and people are increasingly employing AI to monitor diseases, predict how they will spread, diagnose individuals, manage healthcare systems, and evaluate the threat posed by a particular entity to the whole population. The World Health Organization (WHO) and other international bodies agree that AI has the potential to make a global impact; the WHO does, however, stress that it should be used in a fair manner, be accessible to all, and conform to strict standards (WHO, 2021).

The signs and symptoms of the patient's disease should form the foundation upon which medications and treatments for COVID patients are developed (Tamayo & Rodillas, 2023). The Covid-19 pandemic led to a faster adoption of AI in public health. At the beginning of the pandemic, AI models quickly emerged for outbreak forecasting, digital contact tracing, and real-time resource allocation, achieving predictive accuracies over 85 percent in identifying hotspots (Olawade et al., 2023). Machine learning (ML), natural language processing (NLP), computer vision, and large language models (LLMs) have become major influences in healthcare; AI can change how we conduct surveillance, prediction, decision support, and communication, working with large and varied kinds of data. It is used to detect disease outbreaks, classify people by risk, and manage health resources and communication (Olawade et al., 2023). These developments show that AI not only makes work more efficient but also provides new ideas to improve population health.

Given AI's growing significance in public health, researchers are conducting studies to make the most of its potential to address public health challenges. Research has shown that AI can be applied in several ways in public

health, for example in surveillance and outbreak detection, pandemic management, logistics, intervention, targeted interventions, and in low-resource settings. Tagorda et al. (2023) carried out a study to reveal several health issues which, if not detected and corrected early, could lead to poor work performance among employees. Some of the factors considered in the study were not found to be significant predictors. The use of AI could help to identify other factors that should be considered in future studies. Machine learning and deep models have been found to improve the timeliness and sensitivity of epidemic monitoring at the local level and extend it to the global level when compared with traditional statistical models (Zeng et al., 2021). AI can be used to develop predictive models for communicable diseases and to use AI-powered computer-aided detection systems to screen for tuberculosis (TB) (Qin et al., 2024; Hwang et al., 2024). AI-assisted analysis of X-rays has made it easier to detect tuberculosis in remote areas that have few resources. As a result, earlier diagnosis and treatment have been achieved (Qin et al., 2024). AI also has the possibility of helping people who have long-term illnesses such as cancer and heart disease by taking their images, predicting their risk of deterioration, and allowing their condition to be monitored from a distance (Silcox et al., 2024). Moreover, McKee et al. (2024) stated that AI-based predictive algorithms which combine social media, mobility, and environmental data can predict outbreaks and assist in optimizing the allocation of supplies and workforce during pandemics. At the same time, predictive analytics can identify populations at risk for the purpose of preventing chronic diseases and prioritize interventions (Sultana & Aktar, 2024; Olawade et al., 2023). Sultana and Aktar, as well as Olawade, stressed that predictive analytics have improved the precision of preventive strategies. Case studies on public health surveillance in Africa, as claimed by Tshimula et al. (2024), showed gains in both accuracy and timeliness but also highlight the need for tailored deployment strategies and infrastructure support. Inequality in access to healthcare remains a serious problem due to the shortage of health workers and providers, which redounds to a less efficient and slower healthcare service delivery.

Even though there has been quick advancement in the use of AI in public health, various research gaps prevent the field from showing a real global health impact. Most of the studies focus on algorithmic performance criteria (for example, accuracy, sensitivity, and the area under the curve) without making a causal connection to better health outcomes at the population level (Ali, 2023). Representation of the data and bias in the algorithms are still major issues. Very few datasets are obtained from low-resource settings or include people from those areas, which hampers generalizability and brings up ethical concerns regarding the equity and validity of some of the outputs when they are used in those contexts (Lin, et al., 2025).

Despite efforts made to make AI more explainable, there is limited empirical evidence showing that this leads to greater acceptance among decision-makers or has a positive effect on public health outcomes (WHO, 2021). The complexity of governance, concerns data privacy, and the problem of interoperability also hinder the integration and scaling of AI models and cross-institutional AI systems, especially in global health settings where data infrastructure is fragmented (Olawade et al., 2023). Moreover, questions regarding workforce preparedness, the implementation of AI, and the mechanisms employed to govern its actual use have so far remained largely unanswered, which raises doubts about accountability, scalability, and long-term sustainability (Panteli, 2025). The fact that there are these gaps in research and innovation shows the importance of going beyond proof of concept and concentrating on a research programme that deals with the integration of AI innovation and population health outcomes. Such research programmes should seek to provide empirical evidence regarding the effect of AI innovation on real-world practice; this is particularly important in places where significant health inequalities are most likely to occur, such as in low-resource countries. The research should also work on developing frameworks which support ethical and governance issues.

Hence, dealing with the various issues concerning the management and responsibility of AI innovations will lead to greater accountability, inclusivity, and transparency. Furthermore, because of the socio-technical complexity of AI-public health systems, there needs to be interdisciplinary cooperation involving computer scientists, public health experts, social scientists, and policy stakeholders.

Even though steps have been taken to identify potential applications and to improve the state of the art, global inequalities continue to exist. Over 70 per cent of the publications at the interface of AI and public health together with adequate data infrastructure are located in high-income countries, while lower- and middle-income countries encounter global inequalities at every level of research, whether it be in regard to funding for relevant activities or in terms of not having sufficient access to data. As a result, obstacles have been created which prevent technology from benefiting all populations (UNDP, 2025; BMC GPC, 2025). Furthermore, the existing studies place excessive emphasis on algorithmic performance rather than on outcomes at the population level. Limited and low-quality evidence regarding sustained and improved morbidity and/or mortality because of AI has been found (Panteli et al., 2025; Silcox et al., 2024).

To address these gaps, mapping the AI-public health research domain is essential. This study uses systematic mapping and bibliometric analysis to highlight research trends, advancements, and geographic patterns in AI applications in public health research (Lin, et al., 2025). Examining the evidence of the use of AI innovation for public health should address current emphasis on AI accuracy and include analysis of the impacts at the population level with utilization of outcome focused evaluation methods such as RE-AIM and GRADE; including cases where the use of AI, linked to reductions in incidence, morbidity or mortality or inequities have been identified (Panteli, 2025). Investigating issues and challenges like bias and disparities, transparency, and governance limitations is an approach that targets ethical challenges in the studies, such as accountability and trustworthiness; using appraisal tools such as PROBAST and bias checklists could help address whether research utilizing AI tools has produced outcomes consistent with global public health goals (WHO, 2021).

The study is important since it combines the current body of evidence, identifies research gaps and establishes a future research programme relating to the appropriate use of artificial intelligence in public health. Through investigating the global changes, developments and health outcomes driven by AI use, this research will provide health regulators, researchers and practitioners with an evidence-based foundation to set up technology-driven interventions around public health needs. Further, it aims to address the global need for more clarity around such developments and delineate between innovation with ethical and equitable considerations in mind (WHO, 2021). In the end, its hope is to use technology as a means of raising the potential of AI to improve population health.

Theoretical Underpinnings/Review of Related Literatures

The application of artificial intelligence (AI) in public health has transitioned from experimental to an essential element of the toolbox, affecting areas like surveillance and diagnostics. Emerging research shows that a growing library of standard AI tools can enhance disease prediction and facilitate more personalized approaches to healthcare. For instance, AI platforms are being harnessed to facilitate early diagnosis of tuberculosis and non-communicable disease in rural communities, providing better diagnostic access and speedier responses (World Economic Forum, 2025).

Undoubtedly, recent research has proved the transformative impact of AI on public health (Ratnam 2025), in particular with generative AI technology such as ChatGPT-4o and Gemini (IBM), which can be leveraged for writing scientific articles, translating health messages and educating the general population about more sophisticated research related to healthcare and medicine, especially with the assumption of new AI tools in developing countries (Ratnam, 2025). But there are significant ethical concerns to consider regarding the use of these new tools.

Questions of equity and ethics are particularly relevant when considering the future of artificial intelligence (AI). Ghanem et al. (2025) identify how AI can potentially perpetuate existing health inequalities due to problematic training data, the underrepresentation of marginalized groups and for reasons of unclear decision-making processes. Dankwa-Mullan (2024) reiterates this point when highlighting the need to use AI in an equity-centered fashion to prevent further magnification of systemic limitations in public health. Authors of both these reports suggest extreme caution should be used with respect to AI and equitable framework development relative to this technology's use, should there be no possibility to improve the advancement of health but there would be a chance to worsen existing inequalities.

Policy-centric reviews highlight the need for regulatory sandboxing, post-market surveillance, and PPPs in responsible innovation. According to WHO's Global Initiative on AI for Health (GI-AI4H), it may be possible to leverage AI to deliver contextualized healthcare appropriately localized when contextualized into traditional medicine and indigenous health care practices (WHO, 2025). On the other hand, the Korea region by far has the most pertinent application of the public health policy for systemic issues of bias, workforce preparedness, and the need for ethical safeguards in AI applications within public health, as laid out by the Kansas Health Institute in their 2025 review of the literature on AI policy.

In essence these two arguments come down to: How do we prepare for and benefit from the disruptive power of AI and publicize our investment in making it widely available. These are, put simply, the two directions our research proposal is following, through a global bibliometric analysis of fundings around AI and public health, to find innovation hot-spots and equity gaps to be plugged. The study focuses on three related theoretical frameworks that explain the diffusion and adoption of artificial intelligence (AI) in health care including: diffusion of innovations theory, the technology acceptance model and ethical frameworks in AI.

Theory of Diffusion of Innovations the Theory of Diffusion of Innovations (DOI), developed by Rogers in 2003, explains how new ideas and technologies spread through societies or social systems overtime. In the context of AI

usage within public health, DOI can be used to explain the differential adoption of AI tools within nations, institutions, and individuals. The “early adopters” of innovations would be those well resourced academic institutions or proactive health systems that would take the lead in introducing innovations while the “late adopters” might face structural barriers in their institutions, such as poor infrastructure, low data availability and limited policy support (Alka’awneh et al., 2025). DOI proposes five “adoption categories” (innovators, early adopters, early majority, late majority, and laggards) that can help us understand the factors shaping the adoption of AI globally, and the associated risks of the unequal distribution of AI.

The Technology Acceptance Model developed by Davis in 1989 emphasized that people are prompted to use the tool because of its usefulness and ease of use.

In the field of public health, recent studies have found that trust in AI outputs, the transparency of the algorithms, and the degree to which the tools fit with current workflows all have a significant effect on acceptance (Hržica et al., 2025). The model also points out the importance of social influence and the voluntary nature of adoption—features which are particularly relevant in public sector settings since policy requirements and ethical review play a role in the introduction of new technology. Since AI is being incorporated into public health decision-making, ethical issues are of the utmost importance. The guidelines produced by the WHO, UNESCO, and the ITU-WHO Focus Group on AI for Health stress principles including transparency, accountability, fairness, privacy, and human-centered design (Chassang et al., 2025). These guidelines support the application of risk-based governance mechanisms that assess AI tools based on the technical performance and societal impact. In particular, the guidelines advocate for post-deployment surveillance, stakeholder engagement, and inclusive design to prevent AI from exacerbating pre-existing health disparities (Dankwa-Mullan, 2024). Through adopting these ethical principles within this project, the bibliometric analysis is interpreted through a lens of responsible innovation and equity.

These theories together form a solid basis for the analysis of AI in public health throughout the world, showing how such technologies are spread and accepted and how they should be governed to serve the public good.

Objectives of the Study

The aim of the study was to examine the potential of AI for dealing with important global health challenges. More specifically, the study

1. Assessed the research trends and publication patterns linked with AI in public health;
2. Identified the main contributors to promoting AI research in public health;
3. Assessed the distribution of document types and the effect they have on the progress of AI in the field of public health and in various subject areas;
4. Looked into the importance of working together in promoting AI applications for global health outcomes;
5. Evaluated the impact of highly cited publications and journals in shaping discussion on AI in public health; and
6. Carried out an analysis of the thematic focus and the emerging trends by using keyword co-occurrence analysis

Methodology

Research Design. The study employed bibliometric analysis to examine trends concerning AI-driven innovations in the field of public health. This method systematically looked at publication productivity, citation performance, authorship features, and the way in which knowledge in this area has evolved (Donthu et al., 2021).

Data collection. For this study Scopus was the database chosen. Scopus, which is Elsevier's multidisciplinary abstract and citation database, has extensive coverage of peer-reviewed journals, conference proceedings, and reliable bibliometric metrics (Elsevier, 2024). It includes more than 25,000 active titles covering a range of disciplines such as scientific, technical, medical and social sciences, which makes it appropriate for carrying out cross-sector analyses of AI research.

Search Strategy and Data Retrieval Process. The search string used was carried out in Scopus without any restriction regarding language, but it was limited to document types referred to as “Article” and “Review” that were published between 1973 and 2024. The search string was made up of: (“artificial” OR “intelligence” OR “public” OR “health”) AND (“role of ChatGPT”), and it was applied to the titles, abstracts, and author-assigned keywords to ensure that all relevant literature was retrieved. The records will be exported in CSV format and will

include the metadata fields such as title, abstract, authors, affiliations, keywords, publication year, and citation count. VOSviewer (version 1.6.16) was chosen because of its strong ability to build and visualize bibliometric networks, while the bibliometric pre-processing (for example, de-duplication, harmonization of author names and institutions) was carried out in Microsoft Excel and R (Aria & Cuccurullo, 2017).

Ethical considerations. The study was examined by the UNP Ethics Review Committee. Since the study involved only bibliometric metadata that is publicly available and was analyzed in line with Scopus's terms of service, with the data presented in aggregate to safeguard the identities of individual researchers, the ethical risks were minimal. The ethical standards were secured by ensuring transparency and reproducibility, and the researchers made known any possible conflicts of interest to ensure an impartial interpretation of the results. Although privacy and confidentiality issues were not great, steps were taken to handle the data responsibly and to avoid identifying the authors unnecessarily, and since the materials used were already published, obtaining informed consent was not necessary. Although human subjects were not used in this study, steps were taken to avoid stigmatization of any country, institution, or research community and to avoid misinterpretation of publication trends through thoughtful analysis and transparent methods. This study brought many benefits by elucidating global trends and innovations as well as the gaps in utilization of AI to public health, as well as presenting the results in a respectful manner to avoid furthering inequalities between regions.

The data gathered in the study were analyzed using VOSviewer software. This software can create graphical visualizations of the co-occurrence of keywords, the co-authorship, and the network of organizations to be able to reveal thematic clusters and research organizations. With this software, literature on a given topic can be visualized to identify the structure and dynamics of the field and its development.

Results and discussions

1. Investigate the research trends and the patterns of publication related to AI in the field of public health.

The trend displayed in Figure 1 demonstrates the increasing volume of research in the public health field that focuses on the application of artificial intelligence (AI) from the years 1973 to 2023; the data represents significant rise in the number of research articles conducted in this field, with a significant rise in the past decade, signifying the growing influence of AI in the sector of health.

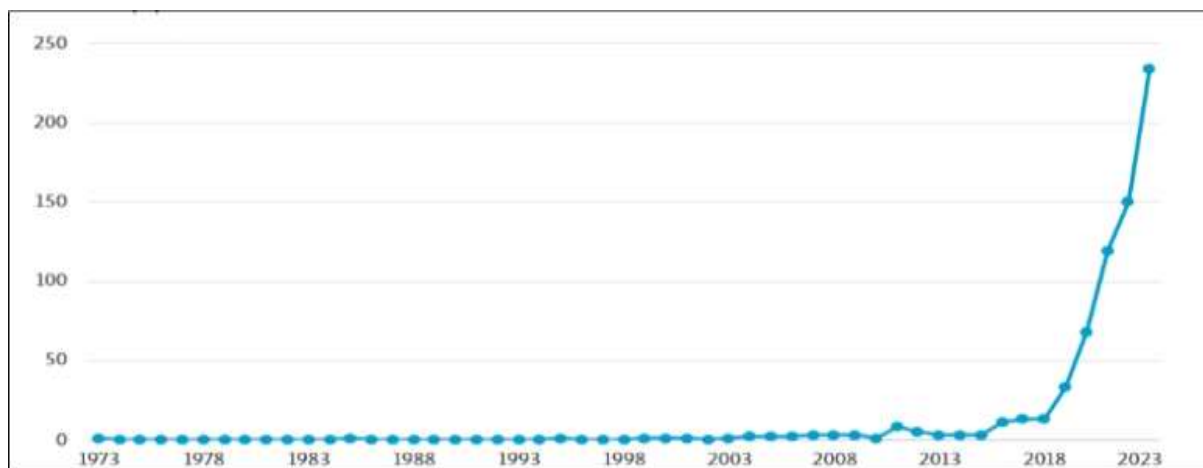


Figure 1. Documents by year

The early years (1973-2007). During 1973-2007 research of the use of AI in healthcare was still at a fledgling stage. During this period the number of publications during this period was very low, on average no more than five annually. This low publication rate was mainly due to major technological constraints of the time, such as limited data along with limited computer power available, which rendered the construction of complex AI techniques impossible in a healthcare context. Shortliffe and Blois (2007) pointed out that early attempts to use AI in medicine were impeded by unreliable data and weak processing capability, although the research conducted provided insight into the potential of AI for diagnosis and clinical decision making.

Between 2007 and 2015, the number of publications on AI steadily grew with a total of eight published articles in 2015. This increased number of publications was caused by a shift in research from theory to practice, and researchers began to examine the potential use of AI in the healthcare sector, especially in predictive analytics,

diagnosis and other operational aspects, as the computational power was enhanced, data collection methods were improved and electronic health records (EHRs) were more widely used for training AI applications. The initial applications of AI showed promising results, especially regarding patient clinical outcomes, including more precise diagnosis, and therefore increasingly convinced people about AI's potential (Obermeyer et al., 2016). This led to a further increased amount of research and experimentation, although issues like algorithmic bias and a lack of generalizability remained to be solved.

Present Years (2015-2023). The number of papers published in AI in healthcare has increased exponentially since 2015, with an especially high increase since 2020; this was mainly due to the COVID pandemic, which highlighted how pre-emptively needed technological advances were in global health. AI played a critical role in all these major sectors such as vaccine design, resource management, epidemic modeling. As Razzak et al. (2019) pointed out, AI was well suited for the task of public health preparedness and response, and as the pandemic hit, its relevance to the task became more apparent. Moreover, with the evolution of other machine learning tools, such as language models like ChatGPT, the application of AI was extended across the entire healthcare continuum, resulting in better diagnostics, patient engagement and administrative workflow. In the words of Naylor et al. (2023), the increased sophistication of AI tools has resulted in a faster pace of adoption, leading to better health outcomes.

Overall, trends in the application of AI research in health appear to follow a paradigm shift—from being a useful, instrumental solution toward an indispensable tool on the global stage. Given the increasing breadth and scale of the use of AI in healthcare, it is clear this discipline is evolving to become integral to a health care infrastructure.

2. The main individuals who have contributed to the progress of AI research in the field of public health

Figure 2 shows the publication trends in several academic journals between 2003 and 2023, highlighting the major sources that have contributed to research on AI in public health. Among these journals are *Frontiers in Public Health*, the *Journal of Medical Internet Research*, the *International Journal of Environmental Research and Public Health*, *Lecture Notes in Networks and Systems*, and *Lecture Notes in Computer Science*; the publication trends for each journal reveal different patterns in the incorporation of AI into public health research.

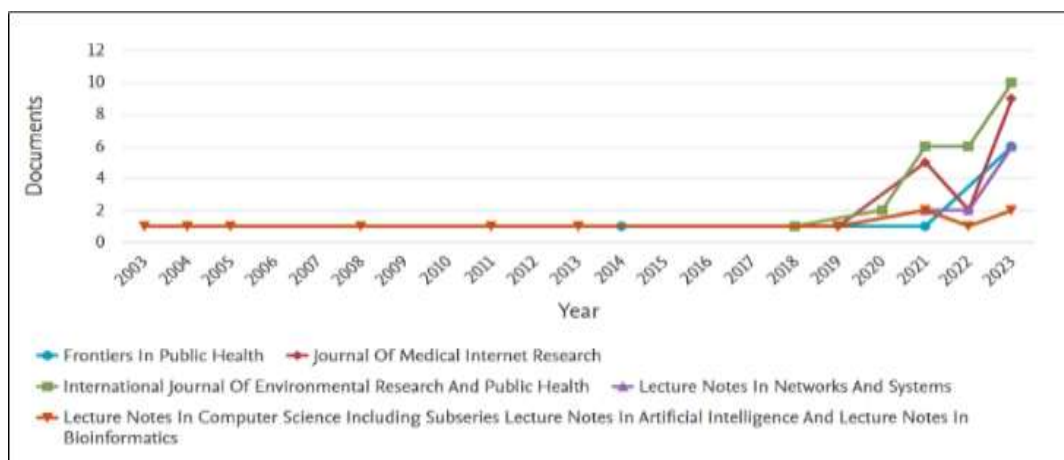


Figure 2. The number of documents per year by source

Frontiers in Public Health. Between 2019 and 2023 the journal. *Frontiers in Public Health* (shown in blue) issued eight documents, showing a steady increase in the number of publications, especially between 2019 and 2021. This increase shows that there is growing awareness of the potential that artificial intelligence has for improving public health practices, for example in the areas of disease prediction and management. The findings are in line with those of Raghupathi and Raghupathi (2020), who emphasized that transformative role of AI in making public health interventions more efficient and accurate; indeed, the journal's contributions have become all the more relevant since public health authorities are now using AI solutions to manage health crises effectively.

Journal of Medical Internet Research. Of the number of publications in recent years, a total of 18 papers were published from the year 2019-2023 in the *Journal of Medical Internet Research* (shown in red) which demonstrated the connection that is gradually happening between the two fields of technology and healthcare. The increase in publication number especially during the COVID-19 pandemic, implies that the journal has demonstrated leadership in promoting research in AI and digital health to address urgent healthcare needs. The important role of the journal in facilitating research at the intersection between conventional medicine and

technology has been already identified by Vayena et al. (2018) which has resulted in the development of telemedicine, predictive analytics and improving patient health.

International Journal of Environmental Research and Public Health. International Journal of Environmental Research and Public Health (green) published a total of 25 articles from 2008 to 2023, with the highest number in 2023, demonstrating a focus on the intersection of environmental health and artificial intelligence. The journal's emphasis on the effect of environmental factors on public health aligns with the discussion in Prss-Ustn et al. (2016), about the significant effect of environmental factors on health, but it has expanded the content of public health studies using AI to explore new approaches to environmental risks.

Lecture Notes in Networks and Systems. Meanwhile, the purple line representing Lecture Notes in Networks and Systems displays a considerable fluctuation in the number of publications (12 articles) published in this interval from 2021 to 2023. The rise in the number of articles shows that the same volume of interest that exists in the development of AI for the optimization of healthcare networks and systems management is increasing. Furthermore, Cox, et al (2021) pointed out how AI can save healthcare systems from logistical challenges and enhance their efficiency by optimizing various operational challenges such as resource management and patient flow. In addition, this is much needed in the world today, where healthcare systems around the globe are trying to tackle global health issues.

Lecture Notes in Computer Science. Lecture Notes in Computer Science (in orange) had a total of 12 publications over 21 years, which has been consistent but has declined since 2021. There could be a leaping of publications in this journal from foundational AI studies to applied focused ones that could potentially be published in other journals in the future. Barlow et al. (2018) mentioned that the rate of change of AI could be so fast that the rate of article publication in traditional publication methods might decrease, though, it is still one that can be relied on for the foundations of AI.

These journals collectively serve to demonstrate the ever evolving and progressive aspect of AI research in the field of public health. The sudden rise in the volume of publications in journals like Frontiers in Public Health and The Journal of Medical Internet Research demonstrates how widely AI has come to be recognized as an important interdisciplinary approach to a myriad of present-day public health problems. Likewise, publications regarding environmental health and optimized healthcare systems reflect the broadening of AI applicability in the field of public health. However, a decline in the number of publications in core journals suggests the promotion of more niche inter-disciplinary research.

Figure 3 displays the 10 authors who have the most publications about AI and public health, providing valuable information about the leading experts in this emerging field. The author 'productivity' is represented by the number of papers an author has published.

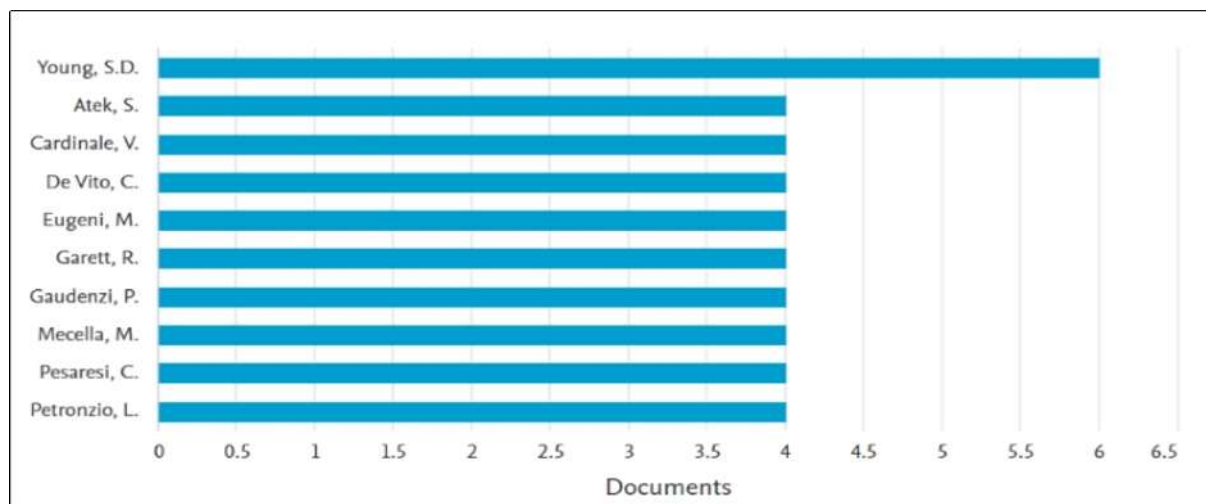


Figure 3. Documents by Author

Leading Contributors. The most prolific Young S. D. has published more than 6.5 papers, making her a leading researcher on the topic of AI and public health. Her high productivity has been the major factor in encouraging the implementation of AI tools into health interventions. In her research, algorithms have been applied to examine different health data, and she has contributed significantly to the fields of disease prediction and management. The

research studies conducted by Young et al. (2021 and 2022) have demonstrated her effectiveness in establishing AI's effectiveness in health intervention. Her work has provided a fundamental guideline for integrating AI-powered tools into public health and inspired further development in this continuously emerging field.

Collaborating Authors. Scientists who have collaborated, including Atek, S.; Cardinale, V.; De Vito, C.; Eugeni, M.; Garrett, R.; Gaudenzi, P.; Mecella, M.; Pesaresi, C.; and Petronzio, L.; each published approximately four papers. Although the volume of their output is smaller than that of Young's, their consistent research activity demonstrates that they make a significant contribution in particular field in AI, namely in predictive analysis and optimizing practices in health care system. The partnership of those authors on topics could result in the invention of new techniques for solving complex health issues. Cross-disciplinary cooperation is instrumental in supporting innovative thinking in public health AI; therefore, the collaboration between two authors is instrumental for the provision of variety of solutions for applying AI.

Impact on Public Health Research. Figure 3 demonstrates the role of multiple individual and collaborative efforts in promoting and developing AI as a discipline within public health. While the research of Young is exclusively concerned with ML, the specific research domains of other authors have all supported and added to the corpus of literature. The patterns of authorship and collaboration provide important insights into the development of a research field.

In summary, the work of these authors illustrates the perpetuation of the symbiosis between individual innovation and collective cooperation in the evolution of AI research; highly prolific authors such as Young S.D. argue for big breakthroughs while the collaboration between the remaining team members stimulates holistic approaches to the application of AI in public health. This characteristic facilitates a strong foundation for future endeavors to apply AI to enhance health and provides a means of addressing urgent public health issues. For the full impact of AI to be utilized in public health in the future, ongoing collaborations and collaborative partnerships between relevant fields are imperative.

Figure 4 shows the universities that are leading in research into the use of AI for public health, emphasizing the number of documents they have published.

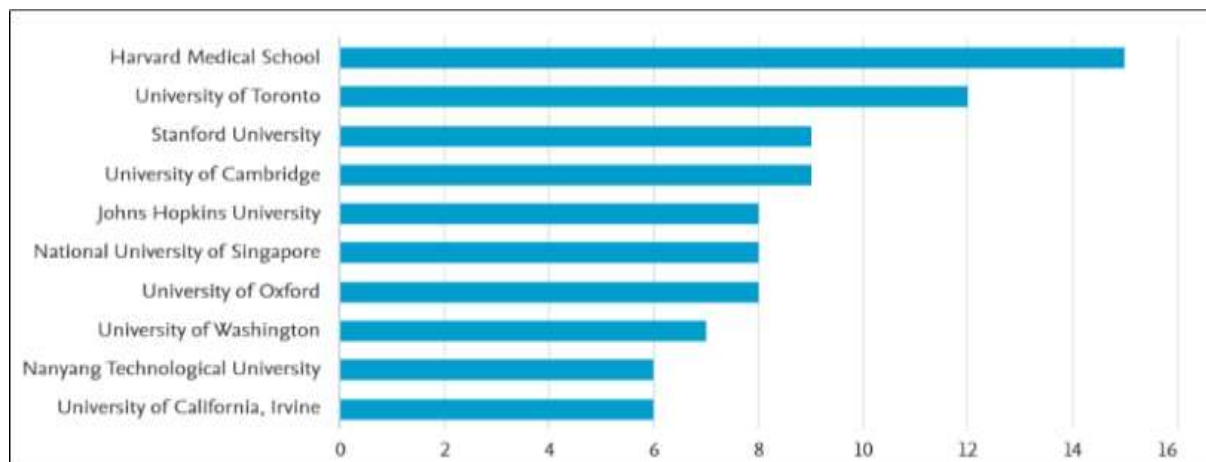


Figure 4. Documents from the University

Harvard Medical School

Harvard Medical School ranks first in the world with 15.5 publications and has become a world leader in research on AI and medicine. Harvard's commitment to interdisciplinary collaboration has led to trailblazing research integrating AI techniques into applications in public health. As Obermeyer et al. (2019) note, "Harvard's focus on using predictive analytics to improve decision making has had a transformative impact on health care delivery."

University of Toronto

The University of Toronto ranks second best in research center with 10.5 publications. This number truly reflects the climate research of Toronto and its commitment to AI research, particularly towards health informatics. U of T prioritizes machine learning to help them make better decisions regarding public health issues due to the focus

of health informatics, which in addition to an active research community, placed Toronto as one of the best AI research centers in North America (Kushniruk et al., 2020). AI's application to the medical field, mainly how resources should be allocated and how health data should be used, is another aspect which establishes the University of Toronto as a top research and application center in the field.

Stanford University and University of Cambridge

Stanford University (More than 8.5 publications each) and University of Cambridge (More than 8.5 publications each) are the two other institutions where AI-based healthcare research is widely done. Stanford's efforts are particularly well-documented, as its published work on clinical precision and patients' service have been clearly identified (Davenport & Kalakota, 2019). On the other hand, Cambridge has achieved important advances in fields such as genomics and personalized medicine, which shows its expertise in incorporating AI into specific areas of health research. The research carried out by both universities shows that they play a significant role in promoting the use of AI in improving healthcare.

Johns Hopkins University, National University of Singapore, and University of Oxford

John Hopkins University, the National University of Singapore (NUS), and the University of Oxford, each of which has seven publications, play a leading role on a global scale in the areas of artificial intelligence and public health. John Hopkins University's expertise in epidemiology has enabled it to make effective use of AI for the prediction and management of disease outbreaks (Kogan et al., 2020). With a focus on the management of infectious diseases, NUS has applied AI to public health surveillance and response (Gunasekeran et al., 2021). The fact that the University of Oxford is involved in solving global health problems using AI attests to its commitment towards innovations in this field (Soltan, et al., 2022).

Other Leading Institutions

Despite the slightly lesser volume of publication for the University of Washington, Nanyang Technological University, and the University of California, Irvine, they still play critical roles in the advancement of AI research by focusing on application domains such as environmental health, optimization of healthcare systems and the use of multidisciplinary approaches. This indicates the increasing diversity of applications of AI to public health and the relevance of domain expertise when dealing with a specific health problem.

The current state of research shows a hierarchical arrangement in the current landscape of the research with places such as Harvard Medical School and the University of Toronto dominate in both the volume and impact of publications. These institutions have set a benchmark for others by carrying out interdisciplinary partnerships with a patient-centered outlook on the role of AI. Conversely, Stanford and Cambridge Universities have a considerable influence thanks on their skill in genomics, and Johns Hopkins and NUS show how helpful AI can be concerning global health. Despite the disparities among the number of publications, they all showcase the importance of academia in inspiring innovation and integrating AI into healthcare.

Figure 5 lists the ten countries contributing most to the study of AI for public health based on the number of papers published on the issue. The number of papers published is below the bottom axis (x-axis), and the name of country is on the right axis (y-axis).

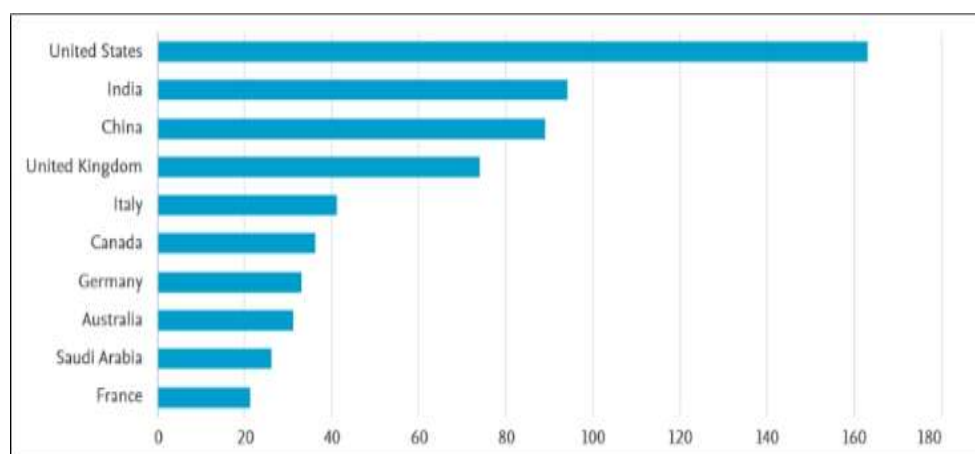


Chart 5. Documents by Country

United States: At the forefront. The United States dominate with about 160 studies, almost double the competitor. The United States has a dominant position in the development of artificial intelligence, since its research

infrastructure, funding policy and leadership in science, technology, and medicine favor this development. The innovative systems ecosystem and financial base in which the United States build on determine the success in this area (National Security Commission on AI, 2021). Consequently, the United States is a global leader in the application of AI to the implementation of public health countermeasures – in particular, predictive analytics, diagnostics, and optimization of health care.

India: A Rising Power. India ranks second with approximately 80 publications, indicating the rapid rise of India on the international AI research stage. This growth can be largely attributed to the broad investment in information technology and healthcare around India under the 'Indian Strategy for Artificial Intelligence' (NITI Aayog, 2018) and their focus on cutting-edge technology. India's recent priorities on Emerging Technologies and growing AI-skilled workforce are consistent with its broader goal of gaining technological competence and subsequently establishing itself as a promising source of AI for public health.

China: China has had a fast-growing number of innovations, with about 76 publications, reflecting its eagerness to keep up the race to be a global center for AI and tech. According to Zeng (2021), it is the strategic implementation of education and innovation by the Chinese Government that resulted in the rapid growth. The China-based research productivity looks at how much the China is concentrating in AI's role in disease surveillance, healthcare assets management, and public health policy development, which demonstrates how China is using AI to improve healthcare.

The United Kingdom is experienced in research and is 4th with around 50 publications. This is likely to be explained by the strong research community and the presence of globally recognized universities, such as the University of Oxford and the University of Cambridge. As Smith et al; (2020) highlight, life sciences and public health are highly prioritized in the UK, leading to excellence in research in areas including genomics, epidemiology and diagnostic approaches using AI. A long-standing academic environment in the UK supports cross-disciplinary research and might help strengthen the status of the UK as a leader in research using AI in public health.

Italy and Canada are major contributors; the two countries have respectively about 45 and 40 publications, these highlighting the strengths that each one brings to AI research in public health. Italy is especially strong in the fields of engineering and medical sciences, many of the contributions coming from institutions such as the University of Bologna. In contrast, Canada's research output is further increased by its interdisciplinary approach to healthcare and environmental sciences, thanks to government funding. Both nations play an important role in developing various aspects of AI for public health and offer valuable insights that add to the global discussion on using AI to improve health outcomes.

Germany: Engineering expertise. The country has about 35 publications and thus shows a solid level of expertise in the fields of engineering and the physical sciences. Germany may fall behind slightly in the level of output compared to Canada, but still plays an important role in AI and public health by emphasizing quality research and working closely with other European countries. As a result, Germany will continue to be a major force in bringing AI to public health.

Other emerging players. The countries that publish the least in the field of AI in healthcare are Australia, Saudi Arabia and France. They appear at the bottom of the list. Of these three, Saudi Arabia is actively working to strengthen its research infrastructure by investing heavily in education and technology, including in AI related research in healthcare. Australia and France, in a similar manner, though participating in the global research system, do not produce much and are focused on specific areas such as health environmental and health tech (telemedicine).

The global research landscape reveals major differences in priorities and investment. While the US remains dominant in both volume and impact, countries like India and China are quickly closing the gap with investments in their burgeoning talent pools. European countries like the UK, Italy, and Germany sustain their relevance in the research landscape by prioritizing quality over quantity through high-quality and interdisciplinary research. Emerging players like Saudi Arabia are creating their own research ecosystems to break into the landscape. All these trends suggest a highly competitive environment that will require focusing on collaboration, innovation, and investments to leave a mark on the future of AI research for public health.

Distribution of document types and their impact on the advancement of AI in public health and in different subject areas

Figure 6 presents a pie chart that visualizes the proportions of all different types of documents among these studies on the application of AI in public health. The variations which can be seen are owing to the lively nature of this area of research along with the way in which information is delivered.

The peer-reviewed articles form the greatest proportion of all types of documents. By accounting for 42.9% of all documents analyzed, it suggests that there is a strong demand for validated research, which produces faithful results and provides key insights into the basic understanding of the application of AI in public health. These articles also rigorously analyze the methods as well as findings and implications, which makes them a fundamental pillar of building evidence-based AI tools for public health (O'Donnell, 2019).

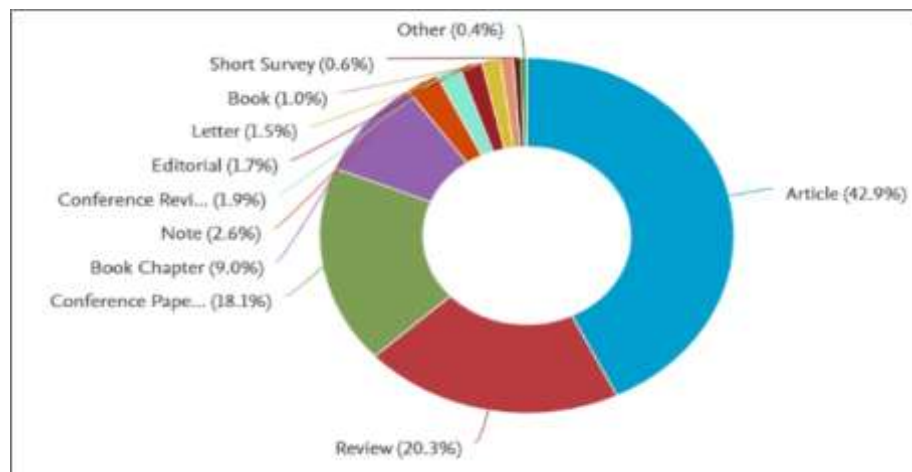


Figure 6. Type of document

Role of Review Papers. The role of review papers is that they make up 20.3% of the documents and thus play a vital role in summarizing existing research and in spotting gaps in the field. Since they offer thorough summaries of several studies, they help other scholars to move more efficiently through the research process. According to Yu et al. (2018), reviews are especially useful in new areas such as the use of AI in healthcare, since they point out trends, challenges and future directions. They act as a guide for researchers and thus enable them to make informed decisions and help to determine the future research priorities in AI applications for public health.

Significance of Review papers. The importance of conference papers is that they account for 18.1% of all publications, which shows how dynamic and quickly changing the field is. Most often, they include current research and address new topics of research and serve as a source of instant dissemination of new ideas (O'Connor et al., 2021). The wide popularity of conference papers shows how collaborative and real-time the nature of AI research is, given that researchers engage with each other to enhance and refine their work. This system allows for rapid feedback and refinement, moving along the rapid pace of AI in public health.

Value of Book Papers. The value of book chapters in this review of AI tools is evidenced by the fact they contribute 9.0 % of the total, and provide an in-depth treatment of niche topics, providing a comprehensive picture of complex topics. They will be particularly valuable to students, professionals and researchers seeking comprehensive coverage of topics related to both AI and public health (Olawade et al., 2023). In contrast to conference articles and papers, book chapters are given room to fully explore theoretical underpinnings, case studies and related impacts so are important to those seeking a deeper dive into what role AI can play in public health.

Short Formats: Notes, Conference Reviews, Editorials and Letters. Other short survey formats such as notes (2.6%), conference reviews (1.9%), editorials (1.7%) and letters (1.5%) help shape academic discussion and highlight emerging trends, summarize conference proceedings and facilitate debate. Williams et al. (2021) show that editorials and letters spark discussion about timely topics and stimulate collaboration and research around new ideas.

Books and Short Surveys. Books (1.0%) and short surveys (0.6%) are not as popular but still provide important information on ongoing trends and expert insights. Their focus on wider discussion of themes and inclusion of multiple disciplinary perspectives broaden the field's understanding (Yu, et al., 2018).

The different types of documents reflect the extent and the complexity of research in AI and public health. The dominance of articles and reviews reflects an intense interest in detailed understanding and the dissemination of in-depth knowledge; the high number of conference papers reflects a rapidly evolving field with a desire for rapid progress and a collaborative spirit; the relatively high number of notes and editorials balance this expertise with shorter, more refined, effective contributions. These different types of documents make up a vibrant research environment offering depth, innovation and access and therefore progressing this area.

Figure 7 shows the distribution of research output on using AI for public health across different disciplines in Figure 7. The percentages represent the percentage of research papers published in the respective disciplines and thus reveal the relationship of research with different disciplinary backgrounds.

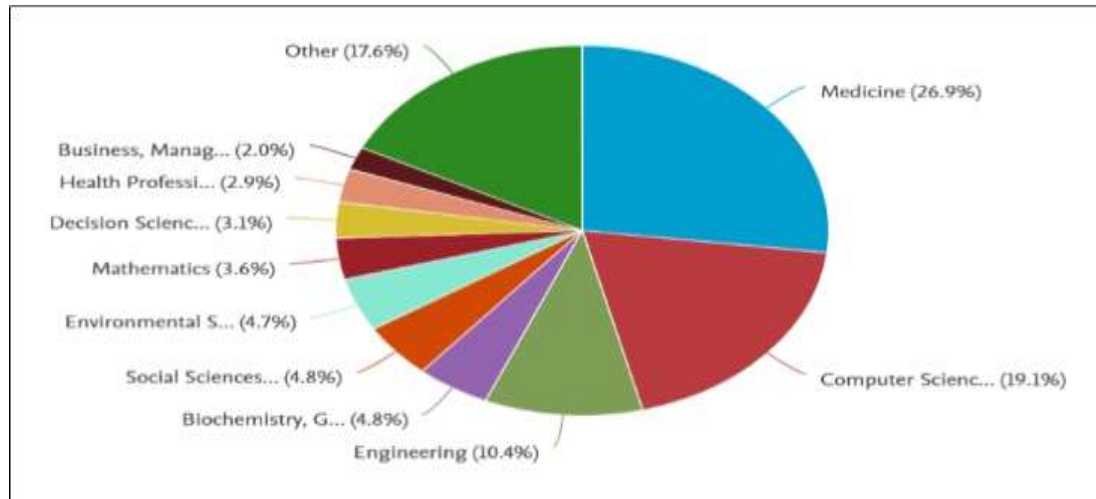


Figure 7. Document classified by subject area

Medicine (26.9%) tops the chart of the subject areas for the future, which correlates to the global awareness of public health and medicine disciplines, particularly during health issues as seen through the COVID-19 pandemic. The prominence of medicine emphasizes the relevance of AI-enabled technologies in disease prevention, diagnosis, and treatment (Topol, 2019). The application of AI to medicine has enhanced patient care significantly, with the most advancements coming in the fields of predictive analytics, personalized medicine, and clinical decision support (Rajkomar et al., 2019), all of which are critical to addressing healthcare issues on both a personal and systemic level and illustrate the importance of AI in this field.

Computer Science (19.1%) is the second most prominent field and consequently highlights the significant position that it holds within the advancement of health system innovation. The computer science emphasis on AI, data science, and cyber security has been integral to the drive for the enhancement of health informatics, digital health solutions and cyber secured data management (Chui et al., 2020). The development and implementation of machine learning and big data analytics is critical for the refinement of health systems and the reduction of costs, as well as the overall improvement of patient care, demonstrating a strong dedication to the integration of technology for health systems.

Engineering (10.4%) is necessary for applied research that translates knowledge of AI into healthcare service use. Engineering is necessary for new, advanced medical devices, AI systems for diagnosis, and intelligent health infrastructure (Matsuda et al., 2020). Advances made in engineering help make AI more effective and scalable, which ensures that the implementation of AI in the clinic will be successful. This will allow more and better use of AI in healthcare to improve clinical service delivery.

This research is also visible in the field of biochemistry, genetics and molecular biology where research on the core mechanisms of health and disease is conducted (6.4%). Through the interaction of the research field with artificial intelligence, research has been done on genomics, drug discovery and personalized medicine (Zhu, 2020). The field now makes it possible to research more targeted types of therapy and thereby treat patients in a more individualized manner. Combined with molecular biology, researchers can find biomarker which makes early detection possible and intervention more specific and thus more successful in combating many diseases.

The field of Social Sciences (4.8%) emphasizes the need to understand human behavior and the impact of society on health. It is highly relevant in the development of public health interventions and policy which balances

technological innovation with social needs (O'Connor, 2021). Artificial Intelligence in the social sciences has provided valuable data-based insight into health inequalities, behavior and social determinants of health that will support targeted approaches to reducing barriers to care and health outcomes and fostering inclusive and effective public health programs.

The field of Environmental Science (4.7%) recognizes the relationship between health and environmental factors. Research in this field investigates this relationship with the environment is crucial as climate change and pollution are major determinants of health and health research should be carried out using AI (Haines et al, 2020). This specific area of research is on how AI can be used to track changes in the environment, estimate their effects on health and guide sustainability efforts.

Other disciplines such as Mathematics (3.6%) and Decision Sciences (3.1%) contribute the fundamental tools for analysis, model building and optimization in healthcare. Mathematical models and decision sciences approach support both the development of AI and the use of data-driven decision-making in complex healthcare settings. Health Professions (2.9%) consists of studies on the education of the healthcare workforce, clinical procedures, and models of care.

The Health Professions focus on workforce education, working with patient care systems, and clinical practices. The application of AI tools in support of clinical training and organizational efficiency, resulting in better healthcare delivery.

Business and Management (2.0%) indicate the importance of managing healthcare as an economic enterprise that needs administrative control and business planning. The use of Business and Management studies in healthcare can seek operational efficiencies, AI-enabled new business models, and sustainable practices for healthcare delivery.

'The Other Category captures a large proportion (17.6 per cent) of the subjects and encompasses a diverse range of disciplines, which don't contribute directly to healthcare innovation. It highlights the multi-disciplinary nature of public health research, as disciplines like ethics, law, and the humanities can provide helpful perspectives on the societal impacts of AI for healthcare.

This distribution analysis shows how varied and interdisciplinary public health and healthcare-related research are. It makes sense to see a prevalence of Medicine, Computer Science and Engineering as the enabling factors for technological solutions to health problems. Fields such as Social Sciences, Environmental Science and Business provide contextual understanding and systemic solutions that will shape health solutions. Fields such as Mathematics and Decision Sciences underpin a more analytical approach to determining the best solutions to health problems, while Computer Science and Engineering underpin the automated solutions made possible through AI.

4. The importance of working together in promoting the use of artificial intelligence for improving global health outcomes

Figure 8 is a bar chart illustrating the top 10 institutions that have contributed to research aimed at harnessing AI for public health, the contribution being measured by the number of published documents. The number of papers published is displayed at the bottom (x-axis), while the names of the institutions are listed on the side (y-axis).

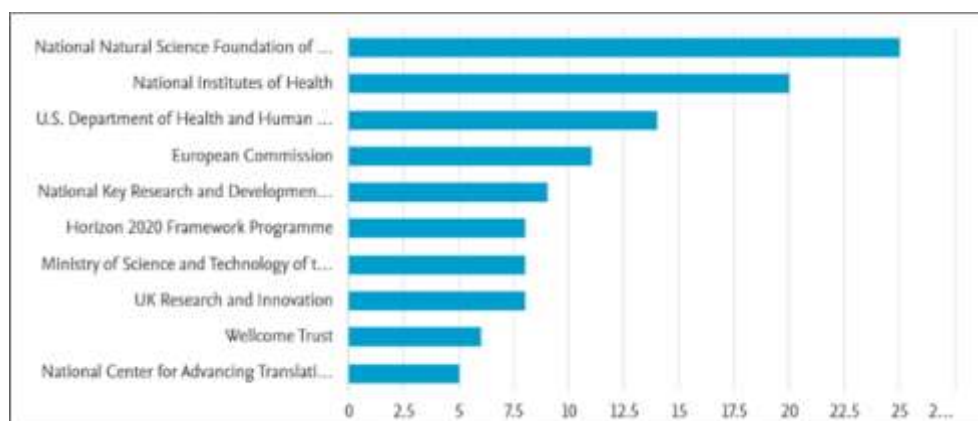


Figure 8. Documents by Affiliation

The National Natural Science Foundation of China (NNSFC) is at the forefront of funding research in the field of artificial intelligence, with a particular emphasis on large-scale health initiatives designed to meet the demographic requirements of China. The projects it finances concentrate on AI-based solutions for the prediction of disease and the management of public health, which is crucial for dealing with the challenges posed by its large and diverse populations. Similarly, the National Key Research and Development Program, which is also a major initiative in China, corresponds to the country's priorities regarding the improvement of its healthcare infrastructure and the enhancement of medical services, especially in rural areas that are poorly served. (Xu et al., 2020)

In the United States, the National Institutes of Health (NIH) leads health research where funding supports efforts to incorporate AI into personalized medicine and clinical practice in early detection of disease and to improve patient outcomes (Davenport & Prusak, 2020). The National Center for Advancing Translational Sciences (NCATS) helps harness AI into translational medicine to help speed up drug discovery and utilize patient data to implement effective clinical strategies (Duncan, et al., 2020). HHS uses AI to help improve public health surveillance, readiness against global pandemics, and address needs of the evolving clinical practice to include predictive analytics and diagnostic techniques, (Paltiel & Zheng, 2020).

Europe also has a considerable amount of funding. Under the European Commission, there are initiatives such as Horizon Europe with financial backing to develop cross-national collaboration on digital health including managing pandemics and chronic diseases, showing how a united effort will help tackle pandemics across the globe. Previous programmes, like the Horizon 2020 Framework Programme, financed projects relating to smart medical devices and innovations in patient care, thus showing the EU's dedication to incorporating AI into healthcare (European Commission, 2021).

The organizations involved include the World Health Organization (WHO), with which national agencies frequently work to promote AI research in low- and middle-income countries. These partnerships make it possible for progress to reach the communities that need it most and thus help to reduce health inequalities worldwide.

The international scene regarding funding for AI research shows a clear example of cooperation between countries and organizations to meet important healthcare challenges. Bodies such as the NNSFC, the NIH, the European Commission and the Wellcome Trust each contribute strengths to this initiative, offering funding approaches that are suited to the requirements of their respective regions. It is obvious that AI has great potential for use in preventing disease, diagnosing and treating it, with various projects concentrating on areas including personalized medicine, emergency preparedness and improved access to healthcare.

5. The impact of highly cited publications and journals on the discussions regarding AI in public health

Table 1 gives a list of highly cited documents concerning the use of AI for public health and offers key insights into the areas of focus as well as the most impactful research in the field.

Table 1. :Top 10 highly cited papers on harnessing AI for public health

Document Title	Authors	Source	Year	Citations
Deep Learning for Health Informatics	Ravi, D., Wong, C., Deligianni, F., ..., Lo, B., Yang, G.-Z.	IEEE JBHI	2017	1,385
A review of 3D vessel lumen segmentation techniques: Models, features and extraction schemes	Lesage, D., Angelini, E.D., Bloch, I., Funka-Lea, G.	Medical Image Analysis	2009	799
Comparing Physician and Artificial Intelligence Chatbot Responses to Patient Questions Posted to a Public Social Media Forum	Ayers, J.W., Poliak, A., Dredze, M., ..., Hogarth, M., Smith, D.M.	JAMA Internal Medicine	2023	661
Explainability for artificial intelligence in healthcare: a multidisciplinary perspective	Amann, J., Blasimme, A., Vayena, E., Frey, D., Madai, V.I.	BMC Medical Informatics and Decision-Making	2020	620
Evaluating the Feasibility of ChatGPT in Healthcare: An Analysis of Multiple Clinical and Research Scenarios	Cascella, M., Montomoli, J., Bellini, V., Bignami, E.	Journal of Medical Systems	2023	407

An empathy-driven, conversational artificial intelligence agent (Wysa) for digital mental well-being: Real-world data evaluation mixed-methods study	Inkster, B., Sarda, S., Subramanian, V.	JMIR mHealth and uHealth	2018	405
Deep learning in ophthalmology: The technical and clinical considerations	Ting, D.S.W., Peng, L., Varadarajan, A.V., ..., Abramoff, M., Wong, T.Y.	Progress in Retinal and Eye Research	2019	341
The Role of ChatGPT, Generative Language Models, and Artificial Intelligence in Medical Education: A Conversation With ChatGPT and a Call for Papers	Eysenbach, G.	JMIR Medical Education	2023	304
Artificial Intelligence Transforms the Future of Health Care	Noorbakhsh-Sabet, N., Zand, R., Zhang, Y., Abedi, V.	American Journal of Medicine	2019	291
Artificial intelligence-enabled healthcare delivery	Reddy, S., Fox, J., Purohit, M.P.	Journal of the Royal Society of Medicine	2019	244

The paper titled "Deep Learning for Health Informatics" by Ravi et al. (2017) is notable as a key contribution to the field of AI, having been cited 1,385 times. It shows that deep learning methods can process large health datasets to improve diagnostic accuracy and predictive analytics. The paper has had a major influence on later research in clinical decision support. The work by Esteva et al. (2019) investigated the effect of deep learning on precision medicine.

The review by Lesage and others in 2009 on the segmentation of 3D vessel lumens has 799 citations and demonstrates the importance of advanced imaging techniques in enhancing cardiovascular diagnostics and treatment planning; it forms the basis for further developments. Bashir and co-workers (2021) improved methods for the analysis of blood vessels to deal with complex cardiovascular conditions.

The study carried out by Ayers et al. (2023) has already received 661 citations because of its assessment of AI chatbots compared with physicians when dealing with health questions on social media. It shows that although AI chatbots can provide information promptly and lessen the workload on healthcare providers, they do not possess empathy or the deep understanding that is present in human interactions. This highlights the fact that the role of chatbots is to complement, not to replace, human healthcare providers, especially during public health crises (Ayers, et al., 2023).

Amann and others in 2020 dealt with the important need for explainability in AI systems and have since received 620 citations. They claim that healthcare professionals need to understand how AI reaches its decisions if trust is to be established and if the AI is to be effectively used in a clinical setting. This agrees with Wong and colleagues from 2021, who also stress that explainability is essential since AI systems are becoming an important part of medical practice, as it improves both the reliability and the adoption of these systems.

Cascella and colleagues in 2023 obtained 407 citations for their study of the applications of ChatGPT in the field of healthcare. Their results show that it has the potential to improve diagnostic procedures and to offer support for mental health, at the same time stressing the importance of having human supervision to reduce errors. This view is in keeping with the general idea of collaboration between AI and humans in clinical environments as presented by Topol in 2019.

The study by Inkster et al. (2018) on the mental health chatbot Wysa has been cited 405 times and shows how AI is able to help improve healthcare access and the quality of healthcare service; Wysa is particularly useful in underserved communities and how it can help overcome the barriers to receiving psychological treatment for people living with mental illnesses (Fitzpatrick et al., 2017).

In Ophthalmology, Ting et al. (2018) studied on how AI can use eye scans to detect eye diseases (such as diabetic retinopathy). This has been cited 341 times and highlights the potential of using human expertise alongside AI to achieve precise patient diagnosis and treatment (Abramoff et al., 2018).

A useful contribution by Noorbakhsh-Sabet et al. (2019) and Reddy et al. (2019), with 291 and 244 citations, respectively demonstrates how AI can be used to optimize healthcare efficiency, service quality and sustainability.

These highly cited studies together demonstrate how much AI is already changing healthcare. While there are intelligent tools available, there is also a common factor in the articles in that there will always be human oversight needed to ensure implementation is ethical, effective and safe.

A focus on themes and the identification of emerging trends using keyword co-occurrence analysis

Figure 9 is a co-authorship network of countries based on research collaboration, has been generated using VOSviewer. Countries are represented by circles (ie, nodes), the size of which corresponds to the number of publications from the country. Lines (ie, edges) between the nodes indicate that researchers from the countries have co-authored publications. The strength of the co-authorship between countries is indicated by the thickness of the line. The different colors of the nodes depict the clustering of countries based on all their co-authorship relationships, ie, close collaboration between countries.

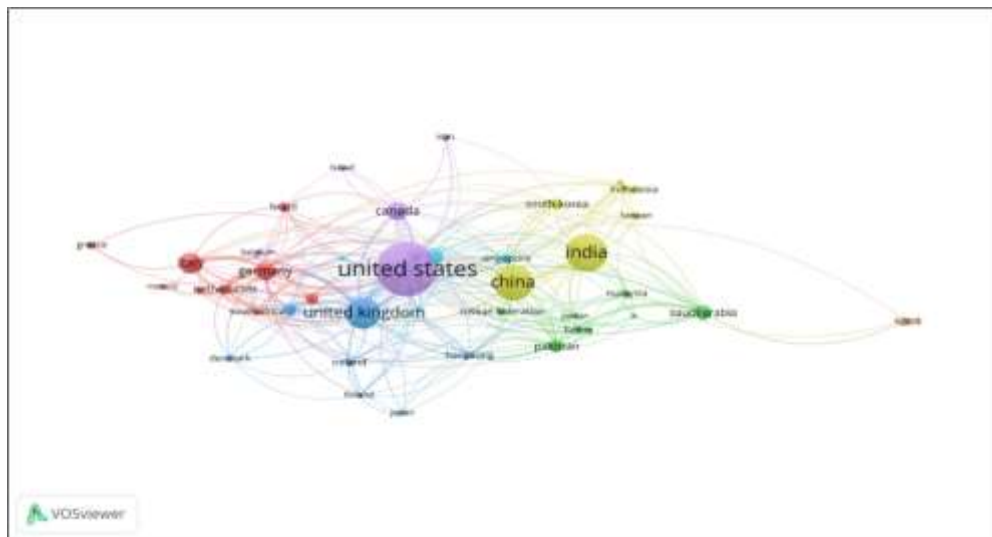


Figure 9. Co-authorship of countries

The Purple Cluster, which is made up of the United States, Canada, Israel and Iran, stands out for its focus on research innovation, cutting-edge healthcare technologies, and their collaboration is focused on using AI in predictive analytics and telemedicine, allowing breakthroughs in patient care, and research into disease management. As examples of contributions, notably by Chaudhry et al. (2020) and Haque et al. (2021), several projects show notable progress in integrating AI into clinical workflows, illustrating the benefits of pooled expertise and resources for the betterment of healthcare delivery.

The Blue Cluster, that of United Kingdom, Ireland, Finland, Denmark, Japan, Singapore and Hong Kong, is characterized by well-developed healthcare systems and advanced public health policies. Regarding research collaborations, the focus is primarily on AI solutions for predictive modeling, patient monitoring systems, and health information systems, improving the efficiency of care, with regards to chronic disease management. As examples of contributions, Gonzalez et al. (2019) and Kumari et al. (2022) highlight the role of AI in streamlining healthcare delivery and developing sustainable long-term patient care strategies.

The Yellow Cluster, with China, India, South Korea, Indonesia and Taiwan, which are driven by their concern for public health issues resulting from their large populations and rapid urbanization, and which cover a very broad spectrum of sciences on population health and GIS-based research, directs their efforts mainly towards developing widely-applicable AI solutions to disease management, epidemic prevention, and resource prioritization and allocation in high-density populated areas. Zhang et al. (2020) highlight the transformative impact of AI in controlling outbreaks and improving access to healthcare in resource-scarce settings, emphasizing the importance of scalable, efficient solutions in these rapidly expanding countries.

The Red Cluster that comprises Germany, Italy, South Africa, the Netherlands, Belgium, Brazil, Greece, and Mexico, particularly emphasizes on health equity and disease prevention as every country has distinct pathways. This diverse experience enables countries to promote global discussions on health policy and equity (Erondur et al., 2020). Research in this cluster focuses largely on the transferability of lessons from other health systems in developed and developing countries. Studies like that of Erondur et al., (2020) indicate a multi-faceted perspective that is essential for sustainable and equitable health outcomes.

The Green Cluster is formed by emerging healthcare systems such as Saudi Arabia, Pakistan, Turkey, Jordan, Malaysia, and the Russian Federation as they ramp up the use of AI. The collaborations in this cluster focus on contextualizing AI to local healthcare needs, and on addressing access to and quality of healthcare issues (He et al., 2018). Researchers like Alshahrani et al., (2021), and Pasha et al., (2021) show the role of AI innovations in strengthening healthcare systems in these nations.

The Orange Cluster which comprises of Egypt has also emerged due to a strategic shift towards using AI to strengthen healthcare infrastructure and disease control. This exemplifies the importance of developing local AI capacity while participating in global networks that can invigorate innovation and collaboration.

The global co-authorship network demonstrates the value of international collaboration for driving improvements in healthcare through AI. Countries that come together through global research networks can share their expertise and resources to tackle common issues and create tailored solutions. The network shows how valuable interdisciplinary and cross-border collaboration is in fostering innovation and in promoting equitable progress in healthcare.

Figure 10 is a co-occurrence network of keywords in the research concerned with using AI for public health. Each circle (node) stands for a keyword, the size of the circle showing how often that keyword occurs in the papers. The lines which connect the circles (nodes) show that certain keywords co-occur in the same papers. The colors are used to group together keywords that relate to the same topics, thus highlighting the various themes in the research.

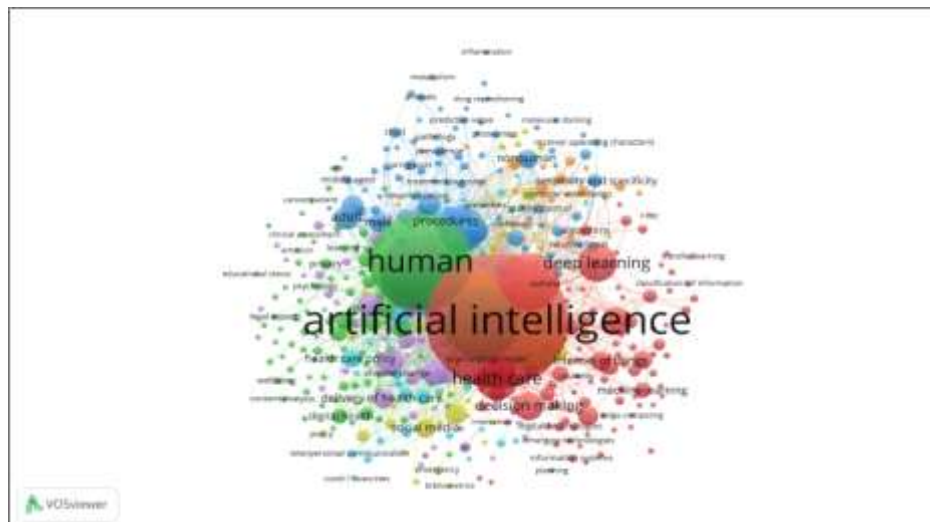


Figure 10. Keyword Trends

Focus on AI in Public Health (Green and Red Clusters)

The Green Cluster, with keywords including COVID-19, pandemic, and healthcare delivery, shows how important AI has been in dealing with health emergencies. When crises such as the COVID-19 pandemic occurred, AI has played a key role in monitoring outbreaks, providing real-time data, and using predictive analytics to help healthcare systems with crisis management. Research has pointed out AI's capacity to monitor the spread of disease and to aid in patient care by means of tools such as disease forecasting models and data-driven resource allocation (Soni et al., 2020; Rahman et al., 2021).

Furthermore, the Red Cluster delineates the operational and clinical efficiencies realized by employing machine learning and deep learning. The application of these tools makes the use of very large data sets by medical staff and can enhance diagnostic accuracy, patient care, and resource utilization. As an illustration, machine learning was applied in predictive diagnostic capabilities and in workflow optimization (Davenport & Kalakota, 2019; Jha et al., 2019).

Mental Health and Patient Engagement (Blue Cluster)

The focus of this Blue Cluster is recent research into the human aspects of AI in the field of healthcare including mental health, empathy and patient engagement. Today, AI-driven chatbots and virtual assistants are developed to provide mental health advice, assess mental health issues and communicate with patients empathically and

effectively. The motivation behind such applications is to address current access-to-care issues with technology that is easy to use and provides empathetic communication. Fitzpatrick et al. (2017), for example, proved that AI chatbots could deliver mental health care and, as a result, successfully improved access to care. The studies also identify the importance of designing AI-based solutions with the ability to respond empathetically, as the use of AI is not meant to substitute human interaction, but to complement it (Kocabiyik et al., 2021).

Ethics and Policy (Yellow Cluster)

There is an increasing concern regarding the ethical aspects of AI in the field of public health, with the focus being on public health ethics and the development of policy. Researchers focus on the importance of implementing AI following principles of equality and transparency, giving the assurance that technologies are safe, bias-free and advantage all individuals (Morley et al., 2020). Policy makers should consider preparing a regulatory framework to address issues as data confidentiality, algorithmic bias and guiltiness in relation to AI systems. As pointed out by O'Neill et al. (2018) the policy makers and other stakeholders in the healthcare field ought to develop an ethical roadmap that envisions the interest of vulnerable groups and builds public confidence in AI application.

Interdisciplinary Themes and Integration

AI takes a multidisciplinary approach to public health, bringing together technology, healthcare and social science. Applying AI in this way ensures that the technical aspect is managed but also creates technologies that address the needs of patients, clinicians and decision makers. For example, in incorporating social determinants of health AI helps address disparities and make patient-centered, context-appropriate decisions (Kellermann & Jones, 2013). To really leverage the power of AI to enhance health outcomes worldwide we must continue to encourage collaboration between disciplines.

The research highlights the variety of applications of AI in public health, from disease prediction and efficiency to ethics and patient engagement. The research shows that this calls for a balanced approach that can overcome technical advances with ethics and the design of human stakeholders. For AI to harness its potential to benefit both health systems and the public, the technology must be integrated with a compassionate approach and equitable policies.

Conclusion

This research highlights the rapid pace of growth of artificial intelligence in the field of public health, demonstrating the potential of this tool to solve complex health issues through a series of recent publications and novel examples. The COVID-19 pandemic represented a launching point for this effort to quickly identify, isolate, and contain emerging health threats, with a particular surge in interest surrounding the use of AI for disease tracking, resource allocation, and vaccine development. This was truly a turning point; examining the role AI has played and could play in future healthcare efforts its ability to leverage data analysis can be critical to protecting the public health now and into the future.

The research identifies the importance of research-specific hubs and the centrality of developed nations in the field. Frontiers in Public Health and the Journal of Medical Internet Research are identified as international hubs of knowledge, facilitating interdisciplinary collaborations and new developments at the nexus of technology and healthcare. Countries with established research ecosystems such as the US and China are facilitating AI innovations and cultivating global networks of cooperation that facilitate the co-creation of accessible and practical healthcare tools. This analysis demonstrates the importance of international collaboration in the landscape of AI research, ensuring that innovations are not insular but instead globally relevant and inclusively addressing public health concerns.

In the future, AI has the potential to revolutionize the way that public health organizations analyze data and interpret trends to improve health outcomes. As AI continues to develop and mature within public health, it is crucial that policymakers, researchers and healthcare professionals consider potential challenges, especially around privacy of data, transparency of the algorithms used and fairness in access to technology. Only by working together can we develop the right policy and ethical framework to guide AI innovation for the benefit of all and to build resilient and inclusive health systems that work for the global population.

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