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PROTECTING VULNERABLE POPULATIONS IN AI-DRIVEN HEALTH-TECH

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ABSTRACT

In recent years, artificial intelligence (hereinafter referred to as "AI") has emerged as a powerful tool in health technology, promising improvements in diagnostics, personalised treatment, and system efficiency. However, as AI systems become more embedded in clinical and public health settings, there is a growing concern that vulnerable populations, such as the elderly, low-income groups, people with disabilities, racial and ethnic minorities, and those with limited access to digital resources, may be disproportionately harmed or left behind. This paper examines the complex risks faced by these populations when AI-driven health technologies are deployed without sufficient safeguards. Through a systematic review of existing frameworks, case studies of AI deployment in health settings, and verified reports, the study identifies key challenges, including algorithmic bias, data privacy gaps, limited transparency, unequal access, and accountability deficits. The results emphasise the extent to which AI health solutions, in spite of their good intentions, contribute to health inequality. It is on the basis of this analysis that the paper is able to provide a roadmap of principles and practical strategies towards the better protection of vulnerable groups that includes: fairness auditing, inclusive data governance, participatory data co-design, and regulatory oversight. It is aimed at making sure that AI in health not only facilitate innovation in medicine, but it also brings equity, dignity, and justice to everyone.

I. INTRODUCTION

As health systems in countries around the globe increasingly face the strain of high cost, ageing, and chronic illness burden, AI is often sold as the game-changer, having the potential to revolutionise contemporary healthcare. The OECD ("*The Organisation for Economic Co-operation and Development*") states that *the potential in the healthcare sector is immense, as are the risks AI may impose; otherwise, its deployment is likely to cause more inequalities as the governance keeps up*. In reaction to this, networks expanding against health inequities

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clarify that tools of AI pose a danger of entrenching inherent health inequalities in opposition to the so-called "key populations" already marginalised.[1] To concisely say it all, along with the prophecy of AI, prognoses about negative outcomes are becoming reality, so it is of the utmost urgency that the question of by whom the vulnerable population can be safeguarded regarding AI-driven health technology is interrogated.

AI in Health-Tech & Vulnerable Populations: On the aspect of health, AI entails algorithms, systems of machine learning, and predictive analytics that help to support diagnostics and treatment planning, conduct monitoring, and manage health systems. These systems take in enormous information volumes of health, genomic, imaging or electronic medical records and create information, expectations or recommendations to clinicians or patients. It is not only that AI in health is not only some technical device, although its use should not contradict the principle of health as a primary right, but rather attempt to act in accordance with ethical, legal, and social defence.[2] But still, there cannot be such systems free of the biases they demand data, and data may be biased. In this method, we have populations, which are on one side of discrimination or ailments. The economy of poor healthcare services is normally vulnerable to individuals with disabilities, rural communities, minority ethnic representatives, the poor, low digital-literate people and individuals with chronic or mental illness conditions. These populations often already experience worse access to medical services, lower quality of care, and poorer health outcomes, and AI systems, if insensitive to these realities, may deepen the divide.[3]

Despite growing scholarship and policy interest, much of the discourse remains high-level and abstract, focusing on principles (fairness, transparency, accountability) rather than examining how these play out in real settings with specific vulnerable groups. Few studies systematically analyse how AI health tools perform (or misperform) when serving people with limited digital access, linguistic constraints, or marginalised identities. Moreover, while several reports, such as OECD joint statements, call for inclusive AI governance and equity, they rarely offer

[1] OECD, *Artificial Intelligence in Society* (OECD Publishing 2019) https://www.oecd.org/going-digital/ai/artificial-intelligence-in-society-eedfee77-en.htm accessed 29 September 2025.
[2] World Health Organization, *Ethics and Governance of Artificial Intelligence for Health: Guidance* (WHO 2021) https://iris.who.int/server/api/core/bitstreams/1cf08afc-eac2-4946-841f-c43032925a1a/content accessed 29 September 2025.
[3] European Union Agency for Fundamental Rights, *Getting the Future Right: Artificial Intelligence and Fundamental Rights* (Publications Office of the European Union 2020) https://data.europa.eu/doi/10.2811/77472 accessed 29 September 2025.

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empirical data or concrete frameworks for implementation. The existence of such a gap implies that technological advancement can possibly surpass the level of safety of people who are in need the most.[4] This paper, thus, aims to shift towards practically one thing: with the use of real or imagined examples of AI use in health settings, how its negative effects might happen, and what can be practically done to prevent these adverse social outcomes in this field. By so doing, the research will pursue to make sure that the AI-motivated health technologies are to improve, and not destroy the principles of equity, justice, and human dignity.

III. The Promise and Perils of AI in Healthcare

AI has clear potential to improve care for vulnerable populations by extending diagnostic reach, personalising treatment, and making services more efficient. Algorithms can screen images at scale, flag high-risk patients for early intervention, and power telehealth and remote-monitoring systems that reach people who live far from speciality centres. When paired with NLP (hereinafter referred to as "*Natural Language Processing*") and translation tools, AI can also help bridge language and documentation gaps that often impede care for migrants, refugees, and non-native speakers.[5] In short, the technology can reduce some longstanding access and quality barriers if developed and deployed with attention to equity.

There are concrete advancements that particularly benefit vulnerable groups. Remote monitoring and mobile health can enable continuous care for people in rural or resource-constrained settings who cannot travel for frequent visits.[6] AI-driven triage and chatbots, when available in local languages and culturally adapted, can increase timely access to advice and reduce unnecessary emergency visits. Predictive models can help target scarce resources (e.g., outreach, vaccinations, chronic disease management) to communities at higher risk, and ML (hereinafter referred to as "*Machine Learning*") approaches to drug discovery may accelerate

[4] National Institutes of Health, *Artificial Intelligence and Health Disparities: Opportunities and Risks* (NIH 2023) https://pmc.ncbi.nlm.nih.gov/articles/PMC11977975/ accessed 29 September 2025.

[5] OECD, *AI in Health: Huge Potential, Huge Risks* (2021) 5–6 https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/01/ai-in-health-huge-potential-huge-risks_ff823a24/2f709270-en.pdf accessed 29 September 2025; Health Action International (HAI), *AI and Health Inequalities: Joint Statement* (2022) https://haiweb.org/storage/2023/05/Joint-Statement-AI-Health-Inequalities-22.pdf accessed 29 September 2025.

[6] Julia Powles, 'When AI Meets Health: Algorithmic Bias and Discrimination Risks' (2019) 27(3) *Health Law Review* 12 https://pmc.ncbi.nlm.nih.gov/articles/PMC6875681/ accessed 29 September 2025; International Medical Council, *AI in Clinical Practice: Policy Brief* (2022) 9–11 https://www.europarl.europa.eu/RegData/etudes/STUD/2022/729512/EPRS_STU(2022)729512_EN.pdf accessed 29 September 2025.

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therapies for neglected conditions that disproportionately affect low-income populations.[7] Natural language tools can extract social-determinant information from notes to inform holistic care planning, potentially improving outcomes for those with complex social needs.

But the risks for vulnerable populations are pronounced and often magnified. Training datasets that underrepresent ethnic minorities, the elderly, people with disabilities, or low-income groups produce biased models that under-diagnose or misclassify these patients; language and cultural mismatches in NLP systems can produce misunderstandings or exclusion.[8] The digital divide means the very tools meant to increase access (apps, wearables, telehealth) may be unavailable to those without smartphones, broadband, or digital literacy. Privacy and surveillance risks disproportionately affect marginalised groups; data linkage and reuse can expose sensitive information or enable discriminatory profiling. Finally, many models are validated only in high-resource settings, so performance can collapse when used in low-resource clinics or different epidemiological contexts.

IV. Ethical and Legal Challenges: Analysis

The integration of AI into healthcare systems presents significant ethical and legal challenges, particularly concerning vulnerable populations. As per EU data, AI systems in healthcare may be trained with ***sub-optimal-quality health data***, leading to potential health risks, especially for key populations.[9] These groups often face specific vulnerabilities and multiple, layering patterns of inequalities, related to age, gender identity, sexual orientation, cultural identity, ethnicity, and race, digital literacy, disability and mental health status, residence status, and who may already face barriers and inequalities in accessing healthcare, potentially increasing health inequities in the European Union.

There is also an ethical issue surrounding the implementation of AI in healthcare, such as ***fairness and discrimination***. The AI systems unwittingly take over the biases ("Algorithm Bias") inherent in the training data by default, thereby treating marginalised groups

[7] Paola Iamiceli and others, *Artificial Intelligence in Healthcare and the Protection of Health as a Fundamental Right* (JuLIA Handbook, 2022) 83–88 https://www.julia-project.eu/sites/default/files/2025-08/JuLIA%2BHandbook%2BAI%2Band%2BHealth_FINAL_AUGUST%2B2025-1.pdf accessed 29 September 2025; OECD (n 1) 7–9.
[8] Council of Europe, Guide to Human Rights in the Age of AI (2021) 42–45 https://www.coe.int/en/web/artificial-intelligence accessed 29 September 2025; World Health Organization, Ethics and Governance of Artificial Intelligence for Health (2021) 28–30 https://www.who.int/publications/i/item/9789240029200. accessed 29 September 2025.
[9] *Ibid*.

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unequally.[10] As an example, one of the studies identified that AI technologies employed in healthcare continue to have a low level of efficiency with the underrepresented population groups because of the lack of data or samples of underrepresented groups and absence of information or life experience on the part of AI developers. This may lead to misdiagnosis or a poor therapy plan for vulnerable patients.

When it comes to AI technologies, the existing regulatory frameworks fail to deal with the complexities that they create. The EU AI Act identifies the general regulatory parameters of AI in order to secure ethical EU development of AI both in and out of Europe, as well as health, safety, and fundamental rights.[11] However, the Act itself is not independent, and requires to be used symbiotically with other legal tools, especially since AI can be embedded into other digital technologies, products, and services. This renders the ***law seriously fragmented***, and this raises confusion and potential gaps of responsibility in cases that constitute harm by AI systems.

Moreover, we have a concavity of ***deepened inequality*** following the use of AI in the welfare systems. These and other algorithms, together with decisions made based on this, are trapping poverty and inequality rather than creating equality in societies proposed by the European governments through automated algorithm processes. As an example, *Amnesty International* reported in 2023 about a system based on World Bank funding in Serbia that automates a collection of steps in calculating social assistance eligibility.[12] Some people who were being supported, particularly the Roma and individuals living with disabilities, were greatly affected since they did not obtain the appropriate data, or bad computations.

These ethical and legal concerns elucidate the necessity in regulating AI in medical care to help prevent exposing potential risk groups to potential risks, spending enough accountability procedures in place, and, in any case, making the responses clear and simple to follow.

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[10] Powles J, 'When AI Meets Health: Algorithmic Bias and Discrimination Risks' (2019) 27(3) *Health Law Review* 12–15 https://pmc.ncbi.nlm.nih.gov/articles/PMC6875681/ accessed 29 September 2025; Health Action International (HAI), *AI and Health Inequalities: Joint Statement* (2022) https://haiweb.org/storage/2023/05/Joint-Statement-AI-Health-Inequalities-22.pdf accessed 29 September 2025.

[11] European Union, *Proposal for a Regulation Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act)* COM(2021) 206 final, arts 1–3 https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-laying-down-harmonised-rules-artificial-intelligence accessed 29 September 2025; European Data Protection Supervisor, *Opinion on the AI Act* (2022) 9–11 https://www.edps.europa.eu/system/files/2022-10/22-10-13_edps-opinion-ai-human-rights-democracy-rule-of-law_en.pdf accessed 29 September 2025.

[12] Amnesty International, *We Had No Chance to Defend Ourselves: Serbia's Social Assistance System* (2023) https://www.amnesty.org/en/latest/research/2023/01/we-had-no-chance-to-defend-ourselves-serbias-social-assistance-system/ accessed 29 September 2025.

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V. COMPARATIVE ANALYSIS WITH RESPECT TO INDIA

International communities are increasingly recognising that AI in health care involves a disruptive potential as well as existential perils for the groups of people marginalized. The *European-AI* governing framework is interested in the protection of human rights, rejecting and anticipating a discriminatory algorithm, and transparency.[13] Regulatory oversight that leads to inclusive access to health services stimulates the reaction of the attempt to secure several structured impact approaches, which are, in this case, AI initiatives. On the same note, AI applications are expected to make healthcare more transparent among underrepresented groups in the *United States* by anticipating heart conditions before they arise, but concerns have been raised about bias and skewed data coverage.[14]

The manner in which it is being done in India is a mere form of these steps, yet it feels enormous potential as compared to other countries. The Government of India has already implemented AI-based projects that are able to improve the access to healthcare for certain vulnerable populations, especially within rural and underserved areas. Ideally, where this affects the tribal districts, such as the *Rayagada deployment of AI-based maternal health and child health monitoring systems to reduce alarming rates of infant and maternal mortality*.[15] These systems administer on the real-time diagnostics and the prognostically examinations to announce out the complications on time and infer timely intervention. The collaboration of leading colleges such as IIT Delhi and AIIMS Delhi has also led to the establishment of *Centres of Excellence of AI in Healthcare,* where solutions are developed based on the national health priorities. These attempts are trying to be on par with innovation and equity.[16]

There is, however, a marvel of India. Despite the hard work, states unevenly share digital infrastructure, and highly vulnerable populations are also likely to remain digitally illiterate and unable to enjoy AI-enhanced medical services. Data governance, to the extent of creating an empty space of responsibility and patient safety, is yet to be realised in the management of

[13] OECD, *AI in Health: Huge Potential, Huge Risks* (2021) 4–7 https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/01/ai-in-health-huge-potential-huge-risks_ff823a24/2f709270-en.pdf accessed 29 September 2025.
[14] Powles J, 'When AI Meets Health: Algorithmic Bias and Discrimination Risks' (2019) 27 Health Law Review 12 https://pmc.ncbi.nlm.nih.gov/articles/PMC6875681/ accessed 29 September 2025.
[15] Government of India, *National Digital Health Mission: Strategy Overview* (2020) 10–12 https://www.niti.gov.in/sites/default/files/2023-02/ndhm_strategy_overview.pdf accessed 29 September 2025.
[16] Government of India, *National Digital Health Mission: Strategy Overview* (2020) 10–12 https://www.niti.gov.in/sites/default/files/2023-02/ndhm_strategy_overview.pdf accessed 29 September 2025.

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data studies. Using the example of the *Personal Data Protection Bill* in India, it remains in its early phases of development, and there exists no awareness of how AI-generated sensitive health data will be secured, specifically on the part of the marginalised groups. That poses possible threats of abuse, bias, or marginalisation in AI-based medical systems.[17]

India can learn lessons from the rest of the world, which might be to consider putting in place stronger regulation regimes, consultative design, and bias audit found in certain regimes in the EU and the U.S. However, any solution has to be based on the socio-economic and cultural realities of India, and the implementation of AI in health-technology must not increase the existing inequalities but maximally expand opportunities and access to care among the most vulnerable populations.

VI. Safeguarding Mechanism and Recommendation: Findings and Discussions

Empirical studies only demonstrate that AI in healthcare can shrink the inequalities gap, and widen it between exposed groups. In another case, an AI program that was created to process patients' needs in *American hospitals was discovered to systematically underestimate the health risks of black patients as compared to their white patients in the primary instance, based on the fact that the algorithm relied on healthcare spending as a simple manifestation of health conditions.*[18] The system mistakenly believed blacks were healthier when, in actual sense, they lacked access to healthcare services. This is not only in India, where AI-based maternal health monitoring is something that is being tested in tribal districts.[19] As promising, limited mobile-based connectivity and low digital literacy imply that not all women will be able to benefit, leaving it a viable option to lock out people in greatest need. Both of these scenarios evoke the idea that AI systems tend to reproduce the biases of the sources they learn and that once uncontrolled, AIs can begin to reproduce the same differences that they are supposed to alleviate.[20]

[17] Amnesty International, We Had No Chance to Defend Ourselves: Serbia's Social Assistance System (2023) https://www.amnesty.org/en/ accessed 29 September 2025.
[18] Powles J, 'When AI Meets Health: Algorithmic Bias and Discrimination Risks' (2019) 27 Health Law Review 12 https://pmc.ncbi.nlm.nih.gov/articles/PMC6875681/ accessed 29 September 2025.
[19] Government of India, *National Digital Health Mission: Strategy Overview* (2020) 10 https://www.niti.gov.in/sites/default/files/2023-02/ndhm_strategy_overview.pdf accessed 29 September 2025.
[20] Weiner JP and others, 'Ethical Challenges and Evolving Strategies in the Integration of Artificial Intelligence into Clinical Practice' (2020) 35(6) J Gen Intern Med 1752 https://pmc.ncbi.nlm.nih.gov/articles/PMC11977975/ accessed 29 September 2025.

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This implies that the systematic mechanism requires the accommodating ethical and inclusive design within AI during design.[21] Ethical design of AI means ensuring that datasets (mirror) another population based on caste, gender, income or geography. The patient-centred frameworks are also paramount in which the dignity, rights and safety of people have been central in the implementation process. Pointers Governments have mandated an algorithmic transparency and impact measurement in Europe,[22] and India has initiated pilot projects and populace health programs.[23] However, without associated institutional safeguards such as frequent inspections by review agencies and medical licensing authorities, there are risk that AI tools could become usable prior to receiving significant scrutiny. When adopting responsible innovation, a balance in the approach with regard to the rate of implementation and responsible prudence with vulnerable patients shall be created.

Governments are the leaders in AI ethical use in healthcare. The future AI Act in the EU also introduces the AI system on risk classification on health; thereof, more rigorous testing and supervision is to be ensured.[24] The Indian regulatory landscape, to contrast, is less well-integrated. Compared to the National Health Digital Mission, which has already offered an easy way to work on the digital health records, there is a lack, as far as liability is concerned, of cases where an AI misdiagnoses or discriminates against a patient.[25] Even the medical facilities must be the gatekeeping of AI technologies through the establishment of internal review boards of the actively used technologies in order to make them satisfy a medical ethic. Without this common responsibility, the risk burden would be disproportionately placed on the vulnerable groups since they may lack the knowledge and resources to convert the negative impacts.

The laws of data protection should be stronger in protecting sensitive health data. *The Digital Personal Data Protection Act of 2023* exists in India, yet it is evident that the individual threats

[21] European Commission, Ethics Guidelines for Trustworthy AI (2019) 12–14 https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai accessed 29 September 2025.
[22] Council of Europe, *Guide to Human Rights in the Age of AI* (2021) 22–24 https://www.coe.int/en/web/artificial-intelligence accessed 29 September 2025.
[23] Ministry of Health and Family Welfare (India), *AI in Maternal and Child Health Pilot Projects* (2023) https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1990674 accessed 29 September 2025.
[24] European Union, *Proposal for a Regulation Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) COM(2021) 206 final* https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-laying-down-harmonised-rules-artificial-intelligence accessed 29 September 2025.
[25] Centre for Internet and Society (CIS), *Artificial Intelligence in India's Healthcare: Opportunities and Risks* (2021) https://cis-india.org/internet-governance/ai-for-healthcare-understanding-data-supply-chain-and-auditability-in-india-pdf accessed 29 September 2025.

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of AI need to be considered, including algorithmic profiling.[26] The training of the algorithms should be made mandatory, and it must include the representation of the marginalised groups of the society: rural population, persons with disability and women, among others. Moreover, the responsibility structures should be implemented, in which AI creators and medical professionals have the same liability to damages as a result of automated implementations. Besides instilling public confidence, it would also encourage greater caution in the use of AI in health-tech. India can learn the best practices used globally, independent audit frameworks and community involvement to provide communities with full citizenship of AI-driven health care and not as passive consumers.

VI.I. Findings of the Paper

The analysis clearly points out that despite the numerous benefits of using AI in healthcare to improve care and increase access, AI in healthcare still poses significant risks. It not only lacks in adequately addressing the structural inequalities, rather it also encourages them. The research question "whether AI-driven health technologies can safeguard equity and justice?" showcases that the current versions are inadequate because of biased data, weak accountability frameworks, and inconsistent legal oversight. These findings highlight the glaring gap in technological advancement: the pace at which it is overtaking legal and ethical safeguards. This leads to an increased risk of misdiagnosis, exclusion, and privacy invasion of marginalised communities. From the perspective of law and policy-building, there is a dire need to develop enforceable accountability measures, inclusive data governance mechanisms, and regulatory clarity. From the perspective of practice, healthcare providers must consider these challenges at the initial step itself and not as an afterthought. Hence, the implications are clear, that AI instead of underscoring itself to be an optimal tool, is rather becoming a tool to widen the rich and poor gap. This calls for urgent need for legal reforms, ethical oversight, policy making, and equity at the centre of AI innovation.

VII. Conclusion and Way Forward

The potential of AI in medical practice is enormous, and opportunities to be more diagnostic, better-accessed and provide individual care exist. The promise will necessitate patient

[26] IIT Delhi and AIIMS Delhi, *Centres of Excellence for AI in Healthcare* (Press Release, 2022) https://www.expresshealthcare.in/news/iit-delhi-aiims-delhi-to-establish-a-coe-for-ai-in-healthcare/449358/#:~:text=Rangan%20Banerjee%2C%20Director%2C%20IIT%20Delhi%2C%20echoed%20the%20sentiment%20and,impact%20the%20lives%20of%20Indians.%E2%80%9D accessed 29 September 2025.

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protection, but the most vulnerable populations that are more susceptible to exclusion and trauma will require the promise. Unprotected innovation is one way of consolidating the existing system of inequality rather than reducing it. The path forward is the development of AI systems, which are technologically focused, yet consider being not only transparent and inclusive, but ethically worthwhile as well. This balance puts a future obligation of being equitable, responsible, and friendly in order to make the benefits of the AI available to individuals who demand it the most, without disrupting privacy and autonomy.

So, to reach such an outcome, law, ethics, medicine, and technology would highly synergise. New regulations must utilise the AI-specific problems and ethical principles must argue that interests of marginalised groups receive the highest priorities. The technologists share the responsibility with their healthcare services of coming up with systems that are understandable, responsible, and close to the real-life situation. Above all, the fact that vulnerable populations have become the priority rather than the appendage in introducing AI health technologies is the most significant point. The future where AI may be exploited in order to enhance healthcare can be realised, but must be achieved through innovation being spurred by good intentions of equity, empathy, and good governance.