Ethical Analysis: Bias and Fairness in AI-Driven Personalized Medicine

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Introduction: Artificial Intelligence (AI) is transforming personalized medicine by predicting treatment outcomes based on genetic data. However, ethical concerns—especially around bias in datasets like The Cancer Genome Atlas (TCGA)—require immediate attention.

Potential Biases:

- **Underrepresentation of Ethnic Groups:** Over 80% of TCGA samples are from individuals of European descent. This lack of diversity skews AI model predictions, often making them less effective or even harmful for underrepresented populations (Sirugo et al., 2019).
- **Data Quality Disparities:** Research reveals that genomic sequencing depth is frequently lower for African-ancestry individuals, limiting variant detection and impairing model accuracy (Landry et al., 2018).

Fairness Strategies:

- **Diversified Training Data:** Encourage inclusive genomic studies and public-private collaborations to gather globally diverse datasets.
- **Bias Auditing:** Regularly test AI models for predictive disparities across racial and ethnic groups.
- **Explainable AI (XAI):** Improve transparency in decision-making to expose and mitigate hidden biases.
- **Ethical Oversight:** Include ethicists and representatives from diverse populations in model development and governance.

Conclusion: Without deliberate interventions, AI in personalized medicine could amplify existing health inequities. Ensuring fairness is not only about technical refinement—it's a moral responsibility that should guide every stage of AI deployment in healthcare.

References:

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- Sirugo, G., Williams, S. M., & Tishkoff, S. A. (2019). *The Missing Diversity in Human Genetic Studies*. Cell, 177(1), 26–31. https://doi.org/10.1016/j.cell.2019.02.048