

Holistic Health Solutions: How AI is Transforming Community Health

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Abstract: The healthcare industry is transforming towards holistic health solutions, focusing on integrating physical, behavioral, and social determinants of health. This white paper explores the role of artificial intelligence (AI) in driving community health and its capacity to create a more comprehensive and equitable healthcare system. AI offers powerful tools for synthesizing data, generating insights, and personalizing care, thus enabling a multidimensional approach that considers the complete health of individuals and communities. Two primary challenges impede the progress of AI-driven healthcare: the fragmentation of health data and the lack of equitable access to digital health tools. Empowering communities with AI-driven solutions can bridge gaps in healthcare delivery, reduce disparities, and improve overall health outcomes. This paper will discuss the current limitations in the healthcare system, examine how AI is being leveraged to address these challenges, and present examples of successful AI implementations in community health.

Keywords: behavioral, integrating physical, multidimensional, Empowering

1. Introduction

Healthcare is fundamentally about enhancing the well-being of individuals and communities alike. Traditional healthcare models have predominantly emphasized physical health, often overlooking health's critical behavioral and social determinants. To truly improve health outcomes, there is an urgent need to adopt a holistic, person-centered approach that integrates these elements. This paper explores how artificial intelligence (AI) is revolutionizing community health by bridging these dimensions.

In the evolving healthcare landscape, AI integration promises to drive significant improvements. AI, with its ability to synthesize vast amounts of data from various sources, offers more profound insights into the social and behavioral factors impacting health. By leveraging AI, healthcare providers can develop more personalized and equitable care plans, ultimately leading to better health outcomes at both individual and community levels. Despite the challenges, AI is well-positioned to address issues such as data fragmentation and disparities in digital access.

This white paper aims to elucidate AI's transformative potential in community health, outline the current limitations in the healthcare system, and showcase how AI can help overcome these barriers. This paper will demonstrate AI's crucial role in achieving a holistic healthcare transformation through a detailed analysis of existing AI applications and future potentials.

2. Current state Limitations of Fragmented Health solution approach

The current healthcare system is marked by several limitations that hinder the realization of holistic health

solutions. These limitations include fragmented health data, unequal access to healthcare resources, and a predominantly siloed approach that separates physical, behavioral, and social health determinants.

- 2.1 **Fragmentation of Health Data:** One of the most significant challenges lies in the disjointed nature of health data. Health information is often scattered across various platforms and systems, making creating a comprehensive picture of an individual's health challenging. The lack of interoperability between different health information systems impedes the seamless integration of data. This fragmentation prevents healthcare providers from fully understanding and addressing the diverse factors that affect an individual's health.
- 2.2 **Unequal Access to Healthcare Resources:** Access to healthcare resources, including digital health tools, is not uniform across different populations. Those in rural or underserved areas often lack access to advanced digital health technologies and reliable internet connectivity. This disparity exacerbates existing health inequities, with specific populations unable to benefit from AI-driven health solutions. Factors such as socioeconomic status, geographic location, and education levels contribute to this unequal access, creating gaps in healthcare delivery.
- 2.3 **Siloed Healthcare Approaches:** The traditional healthcare model often treats physical, behavioral, and social health determinants as separate entities. This siloed approach fails to recognize the interconnected nature of these factors and their combined impact on overall health. For instance, mental health conditions are frequently comorbid with physical health issues, yet they are often treated independently. This separation leads to incomplete care strategies that do

not address the root causes or the entirety of an individual's health challenges.

2.4 Limited Understanding of Social Determinants of Health (SDoH): While the importance of social determinants of health is increasingly acknowledged, there is still a limited understanding of how these factors interact with physical and behavioral health. Social drivers such as housing stability, access to nutritious food, and transportation are crucial in determining health outcomes. However, these factors are often under-recognized and under-addressed in traditional healthcare settings. The lack of focus on SDoH results in missed opportunities for improving health at both individual and community levels.

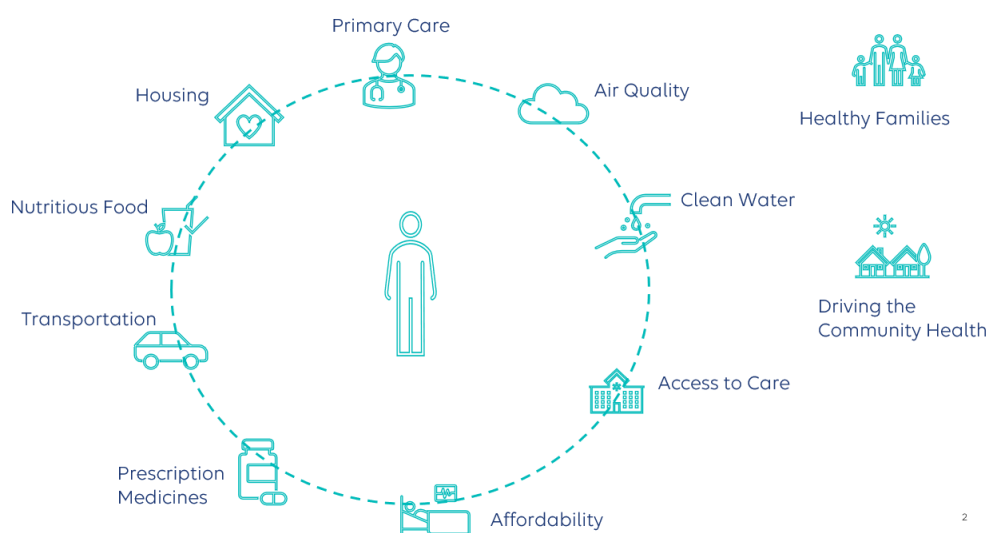
2.5 Insufficient Use of Advanced Technologies: Despite advancements in AI and digital health technologies, their adoption and implementation in the healthcare sector remain uneven. Many healthcare organizations

are yet to fully harness AI's potential for data analysis, personalized care, and predictive analytics. The slow pace of technological adoption is partly due to regulatory challenges, data privacy concerns, and the high cost of implementing advanced technologies. This technological gap limits the ability to provide holistic and proactive health solutions.

To overcome these challenges, it is essential to harness the power of AI in an inclusive, data-driven way and focus on integrating the various aspects of health. AI can play a pivotal role in unifying health data, enabling personalized care, and addressing social determinants by providing actionable insights. By doing so, AI can help create a more equitable and effective healthcare system that genuinely caters to the holistic needs of individuals and communities.

3. Business Solution - Core Elements of a Holistic Health Solution

Person Centric – Health Solution



3.1 Air Quality:

Impact: Clean air is crucial for respiratory health and overall well-being. Poor air quality can exacerbate asthma and other chronic respiratory diseases.

Approach: Implementing policies to reduce pollutants and enhancing air monitoring systems can substantially improve health outcomes.

3.2 Clean Water:

Impact: Access to clean water prevents waterborne diseases and ensures proper hygiene and sanitation.

Approach: Investing in water purification infrastructure and ensuring equitable access to safe drinking water can mitigate health risks.

3.3 Accessible Care:

Impact: Timely and equitable access to healthcare services is essential for early diagnosis and treatment of illnesses.

Approach: Expanding healthcare networks and reducing barriers to care through telehealth services and community clinics improves accessibility.

3.4 Affordability:

Impact: The high cost of healthcare can deter individuals from seeking necessary medical attention, leading to worse health outcomes.

Approach: Policies to reduce healthcare costs, insurance reforms, and subsidized care for low-income populations are critical.

3.5 Prescription Medicines:

- Impact:** Access to necessary medications ensures effective management of chronic diseases and acute conditions.
- Approach:** Implementing prescription drug price regulations and enhancing pharmaceutical distribution networks is essential.
- 3.6 **Transportation:**
- Impact:** Reliable transportation is critical for accessing healthcare services, fulfilling prescription needs, and maintaining employment.
- Approach:** Innovative solutions like ride-sharing partnerships and public transportation subsidies promote health access.
- 3.7 **Nutritious Food:**
- Impact:** Adequate nutrition is the cornerstone of good health, influencing physical and cognitive development and preventing chronic diseases.
- Approach:** Programs like community gardens, food banks, and education on healthy eating can boost food security.
- 3.8 **Housing:**
- Impact:** Safe and stable housing conditions prevent chronic stress and ensure a healthy living environment.
- Approach:** Investments in affordable housing and rent control policies can alleviate housing instability.
- 3.9 **Primary Care:**
- Impact:** Accessible primary care services are essential for preventive healthcare and managing chronic conditions.
- Approach:** Strengthening primary care networks and enhancing care coordination can improve health outcomes.
- 3.10 **Healthy Families:**
- Impact:** Family health, influenced by socio-economic and environmental factors, determines community health norms and trends.
- Approach:** Family support programs, parental education, and child wellness initiatives strengthen family health.
- 3.11 **Community Health:**

Impact: A community's collective health bolsters individual health through shared resources, social support, and local health initiatives.

Approach: Building community partnerships, supporting local health programs, and fostering social cohesion to promote better health.

Integrated and Synergistic Health Approaches

Understanding that no single factor can improve health, Elevance Health promotes an integrated approach, recognizing the interconnectedness of these elements. By fostering synergy across various health determinants, health standards, and outcomes are holistically uplifted.

Example Initiatives:

- **Community Partnerships:** Collaboration with local organizations to provide comprehensive housing, food security, and healthcare access support.
- **Digital Health Enhancements:** Implementing telehealth services and remote monitoring to reach underserved populations.
- **Health Equity Initiatives:** Focused programs to reduce healthcare access and outcomes disparities, such as maternal health programs and food security initiatives.
- **Environmental Healthcare Policies:** Enhancing regulations to reduce air pollution and ensure safe drinking water supplies.

4. Technology Solution – 360 Degree solution

4.1 Data Ingestion and Storage

4.1.1 Data Sources: The most critical data sources are housing records, income statistics, and health data collected from various sources: Electronic Medical Records (EMRs), genetic information, patient health records, and patient lifestyle details. One uses data from wearable devices, live video consultations, patient surveys, and medical records. Public health records, census data, socioeconomic information, and geospatial datasets contribute to the analysis. Mental health assessments, recordings of telehealth sessions, and behavioral data from wearable devices and surveys are also employed. Finally, in addition to the details of the patient appointments, the critical data include the surveys, the data from the wearable devices, and the consumer behavior patterns.

- 4.1.2 **Cloud Storage:** Flexible and trustworthy solutions store structured (like EMRs) and unstructured data (like survey feedback) for easy access and analysis.
- 4.1.3 **Data Integration Tools:** These tools work with sensitive data consolidation simplification from diverse sources, making them compatible and ready for analysis.
- 4.2 **Telehealth Platform Integration**
- 4.2.1 **Real-Time Communication Tools:** Cloud-based APIs like video conferencing allow healthcare providers to perform virtual patient consultations smoothly.
- 4.2.2 **Electronic Health Record (EHR) Integration:** This ensures the safe sending of patient data between healthcare locations and telehealth platforms, constantly using the same care approach.
- 4.2.3 **Video Conferencing APIs:** These assist in online therapy and support sessions, making mental health care more accessible.
- 4.2.4 **Natural Language Processing (NLP) for Patient Interaction:** Chatbots, driven by NLP, can manage tasks like triaging mental health issues and scheduling therapy sessions that work smoothly.
- 4.3 **Data Processing and Integration**
- 4.3.1 **Data Lake:** A central point of storage in which all raw data is deposited, thus enabling highly flexible and rapid analysis.
- 4.3.2 **Data Integration Tools:** Such services amalgamate data from several sources and reformat it into a standard structure. They also combine mental health records, behavior patterns, and physical health data arrays.
- Data Warehousing:** Data that has been processed and structured is kept in warehouses. Consequently, it is easy to query for analytics and reporting. Intricate inquiries that merge mental and physical health data enable thorough analysis.
- 4.3.3 **Digital Engagement Platforms**
- 4.3.4 **Patient Portals:** The platforms' tools also give patients the potential of focused sites where they can view health records, make appointments, and even receive updates.

- 4.3.5 **Telehealth Integration:** Thanks to virtual consultations and chatbot communications, patients and doctors have hassle-free experiences. This method ensures the safe sending of patient data between healthcare locations and telehealth platforms that constantly use the same care approach.
- 4.3.6 **Mobile Health Apps:** Mobile-first apps that are easily accessible on mobile devices have salient features, such as medication reminders and activity tracking, to bridge the patient engagement gap.
- 4.4 **4.5 Advanced-Data Analysis and AI-Driven Capabilities**
- 4.4.1 **Machine Learning Platforms:** Predict at-risk individuals and provide these cloud-based tools with interventions. Create, train, and deploy AI models that can process patient data and predict health risks in the future. Automate operations such as transcription and improve context-aware patient-provider interactions.
- 4.4.2 **Natural Language Processing (NLP):** NLP extracts essential insights from unstructured data sources, such as patient surveys and clinical notes.

Recommended:

- Transformer models (e.g., OpenAI GPT, BERT) for extracting insights.
- Named Entity Recognition (NER) for identifying key health terms.
- Sentiment analysis for patient surveys.

- 4.4.3 **Diagnostic Support:** AI interprets the results obtained from a patient's medical data and imaging to accurately diagnose the disease.

Recommended:

- Convolutional Neural Networks (CNNs) for medical imaging (e.g., chest X-rays, MRIs).
- Bayesian Networks for decision-making in ambiguous cases.
- Ensemble methods (e.g., Random Forests) for multi-modal data analysis.

4.4.4 Predictive Analytics Models: The expectation of patient outcomes based on past and present trends is one of the primary functions of the method. Sift, meanwhile, people who are likely to become depressed and suggest treatment strategies for prevention.

Recommended:

- Logistic Regression for risk stratification.
- Long Short-Term Memory (LSTM) for patient outcome forecasting.
- Gradient Boosting (e.g., XGBoost, LightGBM) for at-risk population identification.

4.4.5 Geospatial Analytics: AI-assisted mapping to display the gap in life expectancy from one region to the other.

Real-Time Monitoring: AI watches doctors' moods, behavior, and physical conditions and warns when treatment is necessary.

Recommended:

- K-Means Clustering for identifying high-risk areas.
- DBSCAN for spatial anomaly detection.
- Heatmap generation using GIS data.
- Anomaly detection models (e.g., Isolation Forests, Autoencoders) for real-time alerts.
- Hidden Markov Models (HMM) for behavior tracking.

4.4.6 Personalized Interventions: Machine Learning suggests mental health programs, counseling, and patient support systems specific to individuals.

Recommended:

- Collaborative filtering algorithms for therapy recommendations.
- Reinforcement Learning for adaptive intervention plans.
- Behavioral clustering for grouping similar patient profiles.

4.4.7 Remote Monitoring and IoT Integration

IoT Device Connectivity: Wearable devices like fitness bands and health monitors measure vitals like heart rate and blood oxygen level.

Remote Patient Monitoring (RPM): The regular monitoring of IoT data highlights possible problematic situations for providers to prevent the patient from being exposed to danger.

Data Visualization and Reporting

Business Intelligence Tools: The management monitors data through real-time interactive dashboards that provide insights into making the right decision.

Analytics Dashboards: These dashboards provide a picture of the natural health trends of patients and operational performance that the stakeholders can visualize.

Geospatial Mapping: Data visualizations show priority areas and allow the stakeholders to distribute the resources carefully.

Behavioral Trends Analysis: These depicted trends make it easier for healthcare providers to establish treatment results over time.

4.4.8 Security and Compliance

Identity and Access Management (IAM): It is imperative that only authorized employees can access sensitive information.

Data Encryption: It protects the information from compromise during storage and transmission periods to secure privacy.

Regulatory Compliance: The organization complies with the provisions of HIPAA and GDPR, maintaining customers' trust and security.

Scalability and Automation

Infrastructure as Code (IaC): Streamlines deployment and resource management for speedy scaling.

Auto Scaling: The system adds resources to the servers to cope with high demand, ensuring systems remain at average performance.

Content Delivery Network (CDN): Minimizes lags and increases the speed of global video consultations.

4.5 Implementation Strategy:

- **Data Collection:** This step requires collecting data from various sources, including housing records, health datasets, and socioeconomic information.

- **Integration:** Work with data lakes and warehouses where this data can be stored, transformed, and further analyzed centrally.
- **AI Model Development and Geospatial Analysis:**
 - Educate machine learning systems to socially oriented algorithms. SDoH.
 - Design models that can predict patient risks, aid in diagnostics, and discover upcoming trends.
 - Combining AI and telehealth, the AI will provide mental health support.
- **Visualization:**
 - Data must be delivered using dashboards and shared with healthcare providers and policymakers.
 - This will make it possible for every patient to deliver quick feedback on performance simultaneously.
 - Digital Platform Deployment: Stream video therapy, patient portals, and mobile apps to attract consumers.

- **Secure Deployment:** IAM, encryption, and compliance measures can guarantee safety and reliability, mitigating security and privacy concerns.
- **Scalability:** With big data, exploit a cloud-based technology framework to cater to the ever-growing data streams and traffic.

4.7 Implementation Framework

To achieve the best solution possible, the following framework is recommended:

- **Cloud Provider Selection:** Based on scalability, tools, and compliance capabilities, the decision could be made between AWS, Google Cloud, or Azure.
- **Infrastructure as Code (IaC):** Leverage Terraform or AWS CloudFormation tools to automate resource provisioning.
- **Containerization:** Develop the AI models in Docker containers maintained by Kubernetes.
- **Monitoring Tools:** Adopt Prometheus and Grafana for infrastructure and application performance monitoring.
- **Data Governance:** Design improved data integrity, quality, and compliance protocols.

Recommended:

Module	Purpose	Components	Algorithms/Models
Data Ingestion and Integration	Aggregate structured and unstructured data from multiple sources.	- Apache Kafka, AWS Glue, Google Cloud Dataflow - APIs using FHIR standards - ETL tools for data cleaning and validation	
Data Warehousing	Centralized repository for structured and unstructured data.	- Amazon Redshift, Google BigQuery, Snowflake - Data lakes (Amazon S3, Azure Data Lake)	
AI and Machine Learning Platforms	Build, train, and deploy AI models for analytics and decision-making.	- TensorFlow, PyTorch, Scikit-learn - AWS SageMaker, Google AI Platform, Azure ML	- Logistic Regression, XGBoost, LightGBM - LSTM for time-series analysis
Natural Language Processing (NLP)	Extract insights from clinical notes, patient surveys, and unstructured data.	- OpenAI GPT, Hugging Face Transformers - BioBERT, ClinicalBERT - SpaCy, AWS Comprehend Medical	- Named Entity Recognition (NER) - Transformer models (BERT, GPT) - Sentiment analysis
Predictive Analytics	Forecast outcomes and identify at-risk populations.	- AWS SageMaker, Azure ML - Time-series analysis tools	- LSTM for trend forecasting - Gradient Boosting (XGBoost, LightGBM) - Logistic Regression

Diagnostic Support	Provide real-time diagnostic recommendations.	<ul style="list-style-type: none"> - Computer vision models (CNNs, YOLO, EfficientNet) - Knowledge-based systems 	<ul style="list-style-type: none"> - Convolutional Neural Networks (CNN) - Ensemble methods (Random Forests)
Geospatial Analytics	Highlight disparities in health outcomes across regions.	<ul style="list-style-type: none"> - ArcGIS, QGIS - Clustering algorithms 	<ul style="list-style-type: none"> - K-Means, DBSCAN - Heatmap generation
Real-Time Monitoring	Track behavioral and physiological signals for timely interventions.	<ul style="list-style-type: none"> - IoT platforms (Fitbit, Apple HealthKit) - Apache Kafka Streams 	<ul style="list-style-type: none"> - Anomaly detection (Isolation Forests, Autoencoders) - Hidden Markov Models (HMM)
Personalized Interventions	Recommend tailored therapy plans and patient support systems.	<ul style="list-style-type: none"> - Recommendation engines (collaborative filtering, content-based filtering) - Behavioral analytics models 	<ul style="list-style-type: none"> - Reinforcement Learning for habit tracking - Behavioral clustering
Data Visualization	Communicate actionable insights to stakeholders.	<ul style="list-style-type: none"> - Tableau, Power BI, AWS QuickSight 	
Security and Privacy	Safeguard patient data and ensure compliance with regulations.	<ul style="list-style-type: none"> - AWS KMS, Azure Key Vault - IAM solutions (AWS IAM, Azure AD) - Compliance with HIPAA, GDPR 	
Cloud Computing	Enable scalable storage and processing capabilities.	<ul style="list-style-type: none"> - AWS, Google Cloud, Azure 	

5. How Everyone is benefitting from the solution

5.1 Benefits

The introduction of Artificial Intelligence significantly altered how we view community health in the constantly changing healthcare landscape. The white paper investigates AI's impact on community health and examines critical aspects like the social determinants of health, personalized and preventive healthcare, and micro-care services.

AI connectivity and precision medicine promise to turn the traditional healthcare service model upside down. The power of AI lies in its use of advanced mathematics and algorithms for insight generation, thus making it possible for the system to think, learn, and equip the clinician with a clear and intelligent augmented analysis of the issue at hand. The latest studies suggest that exploratory research helps resolve the most challenging issues regarding precision medicine if the blending of genomic and non-genomic determinants with the signs and symptoms of the patient, medical history, and lifestyle should be pinpointed in diagnosis and prognostication. The digitization of health-related data and the advancements in AI-powered analytics have opened unprecedented opportunities to augment the care of specialists and address the risks of machine error.

Artificial Intelligence has emerged as a transformative technology with immense potential in medicine. By leveraging machine learning and deep learning, AI can assist in diagnosis, treatment selection, and patient monitoring, enabling more accurate and efficient healthcare delivery. The widespread implementation of AI in healthcare revolutionizes patients' outcomes and transforms how healthcare is practiced, improving accessibility, affordability, and the quality of care. However, integrating AI in healthcare requires a collaborative approach between physicians and technology experts to harness the full potential of this transformative technology while addressing the ethical and regulatory considerations associated with its adoption.

5.2 Addressing Social Determinants of Health with AI

Social determinants can shape community health outcomes in many ways, such as the availability of affordable housing, nutritious food, and earning power. AI tools like Big Data can be applied to pinpoint at-risk populations and recommend ways of engaging them in appropriate interventions. For instance, studies link children's frequent moves and poor housing situations to the various health issues they face. AI can gather housing,

income, and health data to forecast instability and suggest community-wide interventions to minimize these threats.

5.3 Personalized and Preventive Healthcare

AI's integration of electronic medical records is the primary innovation that has made personalized medicine possible by analyzing the patient's medical history, comorbidities, and genetic susceptibility. Research shows that there is a comorbidity of mental and physical health problems, mainly seen in patients with chronic diseases. AI systems can perform pattern recognition in these comorbidities and thus advise preventive care strategies, which could alleviate the burden on healthcare systems and enhance patient outcomes.

5.4 Telehealth and Virtual Care Expansion

With the advent of the COVID-19 pandemic, the adoption of telehealth experienced a tenfold increase, with AI becoming the primary driver of its integration and scaling. According to McKinsey, in the post-COVID-19 estimates, telehealth constitutes a market opportunity worth \$250 billion. By increasing the precision of diagnostic results, automating patient interactions, and supporting remote monitoring, AI-enabled telehealth systems broaden access to healthcare services and enhance the value proposition of virtual care delivery. [2] [1] [3] [4] AI's capability of improving a community's health is unique and likely to come true. With functions such as investigating social determinants, implementing tailored and preventive healthcare, and scaling telehealth and virtual healthcare, AI plays a transformative role in the future approach to community health, increasing accessibility, lowering costs, and assuring healthcare.

5.5 Community Health Insights Through Data Analytics

AI-driven data analytics can provide valuable insights into community health patterns and trends. By analyzing large datasets, AI systems can identify high-risk populations, predict disease outbreaks, and recommend targeted interventions. This can enable healthcare providers and policymakers to make more informed decisions and allocate resources more effectively, ultimately improving overall health and well-being. In conclusion, AI's transformative (sophisticated technology that can modify the healthcare system) power in healthcare can revolutionize community health by addressing social determinants, facilitating personalized and preventive care services, expanding telehealth, and delivering precision medicine. As the healthcare landscape continues to change, the strategic application of AI will be necessary to enhance accessibility, efficiency, and quality in Community health services.

5.6 Enhancing Mental Health Support

Integrating AI with mental health services can also yield significant benefits for community health. AI-powered Chatbots and virtual assistants can provide round-the-clock emotional support, deliver personalized therapy recommendations, and detect early signs of mental health issues. Besides, AI-driven data analysis can help identify at-risk individuals and communities, enabling targeted interventions and mobilizing resources to tackle mental health challenges. [1] Healthcare providers and community organizations can proactively address community health issues by utilizing AI solutions to address the multifaceted aspects of community health. This would ensure a more holistic and equitable system, which would be better for the well-being of the people.

5.7 Promoting Consumer-Centric Healthcare

AI-driven healthcare systems are changing care delivery and empowering consumers to take a more active role in their health. AI applications have led to the emergence of personalized health recommendations, remote monitoring, and virtual care. These activities empower individuals to make more informed decisions, get involved in preventive care, and manage their health more effectively. A consumer-centric approach can ensure the active engagement of patients, improved health outcomes, and, thus, a more sustainable healthcare system.

6. Conclusion

The healthcare industry is at a critical juncture where embracing holistic health solutions is imperative for improving health outcomes. AI holds immense potential in driving this transformation by integrating physical, behavioral, and social health determinants. However, to fully leverage AI in community health, it is crucial to address the current limitations, including data fragmentation, unequal access to digital health tools, and the siloed approach to healthcare.

Focusing on creating interoperable data systems, expanding access to digital health technologies, and fostering an integrated view of health can pave the way for more effective and equitable healthcare solutions. AI's ability to analyze and synthesize vast amounts of data can provide deeper insights into the diverse factors affecting health, enabling personalized and proactive care strategies.

In conclusion, AI is poised to play a transformative role in achieving holistic health solutions. By addressing the challenges and harnessing the capabilities of AI, we can move towards a healthcare system that not only treats illnesses but also promotes overall well-being and health equity. This requires a collective effort from healthcare providers, policymakers, and communities to create a

future where health solutions are truly comprehensive and inclusive.

7. References and Footnotes

7.1 Acknowledgements

This white paper presents the viewpoints of the authors based solely on their knowledge and expertise in the field. It is important to note that the content of this research has no affiliation with or connection to, the author's employers or their employment. The opinions expressed herein are those of the authors and do not necessarily reflect the views of any associated organizations.

7.2 Author contributions

Jerry John Thayil – Conceptualization, Methodology, Writing-Original draft preparation, Visualization, Writing-Reviewing and Editing. **Sadhasivam Mohanadas** – Solution, Software, Validation, Field study, Writing-Reviewing, and Editing.

Conflicts of interest – None Identified

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