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# Enhancing Well-being through Data-Driven solutions in Health Research by incorporating Social Determinants of Health in Electronic Medical Records

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## Abstract

Social Determinants of Health-SDoH are pivotal factors, accounting for 30-55% of health outcomes (WHO, 2023). Beyond SDG3 (Good Health and Wellbeing), other SDGs directly influence health. Therefore, a comprehensive approach is essential to gather and exchange SDoH data across sectors. This policy intervention incorporates the SDoH Data Elements- DEs that enrich Electronic Medical Record-EMR architecture. Incorporating SDoH is an essential factor that enhances individual data capture and collection for better research on health equity, human well-being, and disease surveillance. A descriptive-analytical study assessed existing DEs, datasets, and metadata within governmental EMRs across 15 hospitals and 13 Primary healthcare centres in the West Bank. These metadata were mapped and reviewed in the context of SDoH availability. By reviewing more than four hundred DEs within EMR screens, only a few SDoH DEs were identified, primarily related to patient address and health insurance type. Moreover, downstream SDoH DEs such as housing stability, living conditions, food security, income, education, transportation, social support systems, cultural competency, behavioural health lacked clear classification. The available EMR metadata characterised as limited to medical and financial orientation rather than public health DEs. One key finding of the study is the lack of clear definitions, contextual understanding, and relationships between metadata elements within SDOH data in EMRs in public hospitals. Additionally, inconsistencies in data standards and formats, challenges in tracking updates and versioning, insufficient user guidance, and limited accessibility further hinder the effective utilization and integration of SDOH data within EMR systems. The recommendations are: adding structured and classified SDOH DEs might improve the real-time alerts and predictive analytics

in identifying vulnerable populations more efficiently. In conclusion, aligning EMR design including .SDoH with targeted SDG will help future research on human well-being

**Keywords:** Social determinants of health; Electronic medical record; Digital health intervention; Policy intervention

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# تعزيز الرفاهية من خلال الحلول المقادة بالبيانات في البحوث الصحية من خلال دمج المحددات الاجتماعية للصحة في السجلات الطبية الإلكترونية

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## ملخص

تعد المحددات الاجتماعية للصحة عوامل محورية؛ حيث تمثل 30-55% من النتائج الصحية (منظمة الصحة العالمية، 2023). وإلى جانب الهدف الثالث من أهداف التنمية المستدامة (الصحة الجيدة والرفاهية)، فإن أهداف التنمية المستدامة الأخرى تؤثر بشكل مباشر على الصحة. لذلك، يعد اتباع نهج شامل أمرًا ضروريًا لجمع وتبادل متغيرات المحددات الاجتماعية للصحة عبر القطاعات. يركز هذا التدخل السياساتي على دمج المتغيرات التي تثري بنية السجلات الطبية الإلكترونية. يعد دمج المحددات الاجتماعية للصحة عاملًا أساسيًا يعزز جمع البيانات الفردية وجمعها من أجل بحث أفضل حول العدالة الصحية ورفاهية الإنسان ومراقبة انتشار الأمراض. هذه دراسة تحليلية وصفية ركزت على مطابقة ومقارنة المؤشرات البيئية ومجموعات البيانات والبيانات الوصيفة الموجودة ضمن السجلات الطبية الإلكترونية الحكومية في 15 مستشفى و13 مركزًا للرعاية الصحية الأولية في الضفة الغربية. تمت مطابقة هذه البيانات ومراجعتها في سياق توفر المحددات الاجتماعية للصحة من عدمها. ومن خلال مراجعة أكثر من أربعمائة متغير داخل شاشات الملف الطبي الإلكتروني، تم العثور على عدد قليل فقط من متغيرات المحددات الاجتماعية للصحة ، المتعلقة في المقام الأول بعنوان المريض ونوع التأمين الصحي. علاوة على ذلك، تفتقر الى متغيرات المحددات الاجتماعية للصحة الاخرى إلى تصنيفات واضحة مثل استقرار السكن، والظروف المعيشية، والأمن الغذائي، والدخل، والتعليم، والنقل، وأنظمة الدعم الاجتماعي، والكفاءة الثقافية، والصحة السلوكية. تتميز البيانات الوصفية المتاحة للسجلات الطبية الإلكترونية بأنها تقتصر على المجالات الطبية والمالية ولا تشمل على بيانات متعلقة بالصحة العامة. كما أظهرت التحليل بأن غياب التعريفات الواضحة للبيانات الوصيفة، ومعانيها وسياقها، والعلاقات بين عناصر المتغيرات، ومعايير البيانات وهيئة البيانات، والتحديثات والإصدارات، وغياب أدلة الاجراءات أيضًا. وركزت التوصيات على تخصيص وتوحيد متغيرات المحددات الاجتماعية للصحة . وفي الختام، فإن تنفيذ التنبيهات اللحظية والتحليلات التنبؤية سيساعد في تحديد الفئات السكانية

الضعيفة بشكل أكثر كفاءة، ومواءمة السجلات الطبية الإلكترونية مع أهداف التنمية المستدامة المحلية، وتسليط الضوء على أهمية البحث في رفاهية الإنسان هي عوامل مساعدة في إنجاح السياسات الصحية.

**الكلمات المفتاحية**: المحددات الاجتماعية للصحة؛ السجل الطبي الإلكتروني؛ التدخل الصحي الرقمي؛ التدخل السياسي

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## 1. Introduction

Social determinants of health-SDOH help healthcare providers comprehend the social context of their patients and tailor interventions accordingly (Ahmadi et al., 2022). SDOH has important implications for the design and implementation of health information systems using EMR. Incorporating a comprehensive set of SDOH features in EMR can improve risk prediction models and enhance patient care and outcomes (Yang et al., 2023), (Shane et al., 2023). By implementing a national EMR system, countries can have real-time access to valuable information, enabling better patient record management, clinical care, and health policy-making (Gauchan et al., 2022). Acknowledging all the benefits of incorporating, the SDOH in EMR, still, the adoption of one of the SDOH frameworks is essential to improve the health outcome. One of the well-known frameworks that could be used to study the social determinants of health in digital interventions is the World Health Organization-WHO Commission on Social Determinants of Health-CSDH conceptual framework. This framework emphasizes the development of new and refinement of existing digital health interventions that target intermediary, social, and/or structural determinants of health (Stephanie et al., 2022). Another important model, the social-ecological model recognizes that social risk and protective factors exist across different domains and levels, such as physical disability, household context, and neighbourhood environment (kim et al., 2022). The lack of standardized data about SDOH in EMRs hinders efforts to coordinate care and identify SDOH (Mira et al., 2022). Additionally, there is a deficit in recording SDOH in computerized medical histories, with professionals tending to focus on clinical diagnoses rather than social determinants (Kollapally et al., 2022). These limitations highlight the need for improved integration of SDOH features in EMRs and standardized documentation practices to better address the impact of SDOH on health outcomes.

In Palestine, the EMR was implemented in 2011 in the West Bank including 15 public hospitals: Two Hospitals in Ramallah: Palestinian Medical Complex and Hugo Chávez, one hospital in Jericho, one hospital in Salfit, two hospitals in Nablus: Alwatani, Rafedia surgical hospital, one hospital in Qalqelia Darwish Nazzal, one hospital in Tubas, one hospital in Jenin, one hospital in Tukaram, three hospitals in Hebron- Alia, Doora, Yetta, Halhul, Bethlehe-Biet Jala. There are also 12 Primary healthcare clinics-PHC (Ramallah directorate, Biet Reema and Nileen, Nablus Directorate and Balatta clinic, Qalqelia directorate and Azzun clinic, Hebron: Middle Hebron Center, Karantena, Tarqumia, Um Ad-Dalia). The EMR covers the health services in the hospitals including the following departments in the hospitals: Admission, inpatient, outpatient, Emergency department, operation room, pharmacy, radiology department, laboratory department, haemodialysis unit, and accounting department. The EMR connected all 15 Palestinian hospitals and 12 PHCs through using a unique identifier, the Palestinian Identification number. Many technical reviews were performed to evaluate the quality of data, but none of these focused on evaluating SDOH framework availability. Therefore, it's essential to map the availability of SDoH based on a clear framework rather than embedding ad-hoc SDOH DE within the EMR. However, this study aims to review and map the existing EMR DEs in the Palestinian public hospitals and PHC clinics in the West Bank based on the WHO CSDH conceptual framework. By proposing a new SDoH DE, that by the addressing and capturing of patient data the health research will be augmented.

## 2. Method

A descriptive-analytical study was performed by reviewing the DEs, datasets, and metadata at governmental EMR implemented in 15 hospitals in the West Bank. These metadata were mapped and reviewed in the context of the WHO CSDH. The mapping process started with ethical and administrative approval of the MOH scientific committee where all procedures comply with relevant data protection rules and regulations. The metadata was extracted from the EMR forms and software screens. All forms and screens were listed in an Excel file to be mapped with SDoH. The review process followed Walt and Gilson's policy analysis framework (Walt et al., 2008). A policy review analysis was conducted by examining the data elements, datasets, and metadata within government-implemented EMR systems across 15 hospitals in the West Bank, focusing on content, context, and process.

**Context:** The metadata were mapped and reviewed in line with the WHO CSDH framework.

**Process:** The mapping process began with obtaining ethical and administrative approval from the MOH scientific committee, ensuring all procedures complied with relevant data protection rules and regulations.

**Content:** Metadata was extracted from EMR forms and software screens. All forms and screens were catalogued in an Excel file for mapping with social determinants of health (SDoH).

### 2.1 Study Design

A cross-sectional study was implemented to systematically review, and map metadata extracted from the backend of EMR. The focus is on examining the availability of metadata that is linked with SDoH. The data extraction was performed in June-July 2023 from Avicenna Hospital Information system version number (2.3.10r_SEHA) which was developed by DataSell company-Turkiye. Figure 1 shows one of the screenshots taken from the EMR for review and mapping.

### 2.2 Data Extraction

The metadata extraction process involves retrieving metadata related to patient records, encompassing a range of variables such as patient demographics, diagnostic codes, treatment history, and other relevant details. The metadata has been strictly compiled and assessed with a focus on the various departments and functions within the hospitals and PHC centres. These encompass registration and insurance, inpatient services, outpatient services, emergency room, operating room, pharmacy services, radiology procedures, and laboratory procedures including haemodialysis. The blood bank, pathology department, referral procedures, and cashier department have been thoroughly considered, along with their associated sub-screens.

The extracted data are compiled into a comprehensive master file for further analysis according to the following stepwise approach:

(1) Categorization: According to SDoH, the extracted metadata are categorized into upstream and downstream of SDoH. Upstream factors include broader societal and structural determinants, while downstream factors encompass individual-level influences. This categorization is crucial for understanding the contextual layers of health-related information within the EMR. (2) Mapping Process: Two independent reviewers are engaged in the review and mapping process. Each reviewer assesses the extracted metadata and data elements based on their relevance to SDoH. The reviewers work separately to ensure unbiased evaluations. (3) Confirmation of Lists: Each reviewer collates the identified metadata data and data elements into provisional lists. These lists are then cross-verified and confirmed through a consensus-building process. (4) Confirmed items are considered for further analysis, while any discrepancies or conflicts are flagged for resolution. (5) Conflict Resolution: When conflicts arise between the two reviewers regarding the inclusion or exclusion of specific metadata, a joint discussion is facilitated. Both reviewers engage in a comprehensive dialogue to resolve disagreements, considering the context, relevance to SDoH, and any additional information that may contribute to the decision-making process. (6) Final List Generation: Following the resolution of conflicts and the confirmation of metadata, data, and data elements, a final list is generated. This list represents the mapped metadata and data associated with SDoH within the EMR system. Data mapping (Matching) is employed to analyse the final list of mapped metadata data. This includes summarizing the frequency and distribution of metadata within the upper and downstream of SDoH. (7) Ethical Considerations: The study adheres to ethical guidelines, ensuring the confidentiality and privacy of patient data. (8) Limitations: Potential limitations, such as the generalizability of findings and the accuracy of metadata extraction, are acknowledged. Steps are taken to mitigate biases and inaccuracies throughout the study.

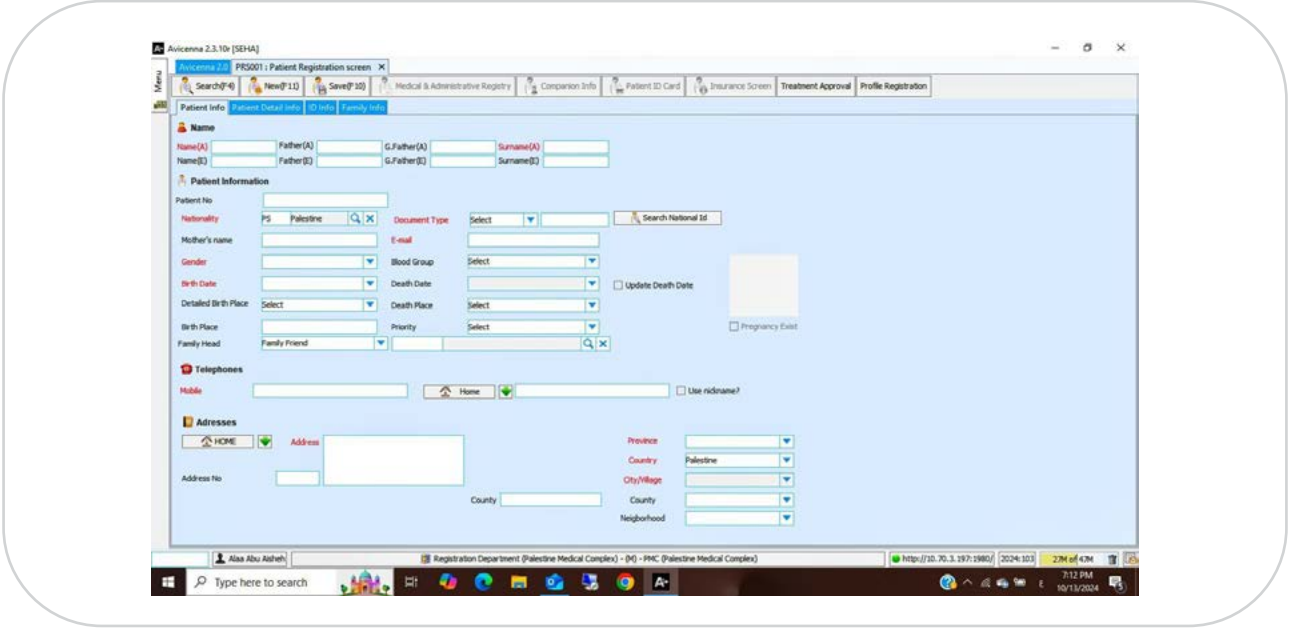


**Fig. 1:** Screenshot from the Palestinian EMR (PRS001) Patient registration screen. Version 2.3.10r. June 2023

## 3. Conceptual framework

The conceptual framework in this study was based on the Commission on Social Determinants of Health conceptual framework (Solar & Irwin, 2010). This model helps to generate and develop new data elements with the EMR design. The Commission's report recommended three principles of action: (1) Improve the conditions of daily life – the circumstances in which people are born, grow, live, work, and age. (2) Tackle the inequitable distribution of power, money, and resources – the structural drivers of those conditions of daily life – globally, nationally, and locally. (3) Measure the problem, evaluate action, expand the knowledge base, develop a workforce that is trained in the social determinants of health, and raise public awareness about the social determinants of health. These three recommendations require patient data that is generated from EMR and could be used in several interventions and policies. A list of independent variables was introduced to help understand and capture the SDOH data within the EMR.

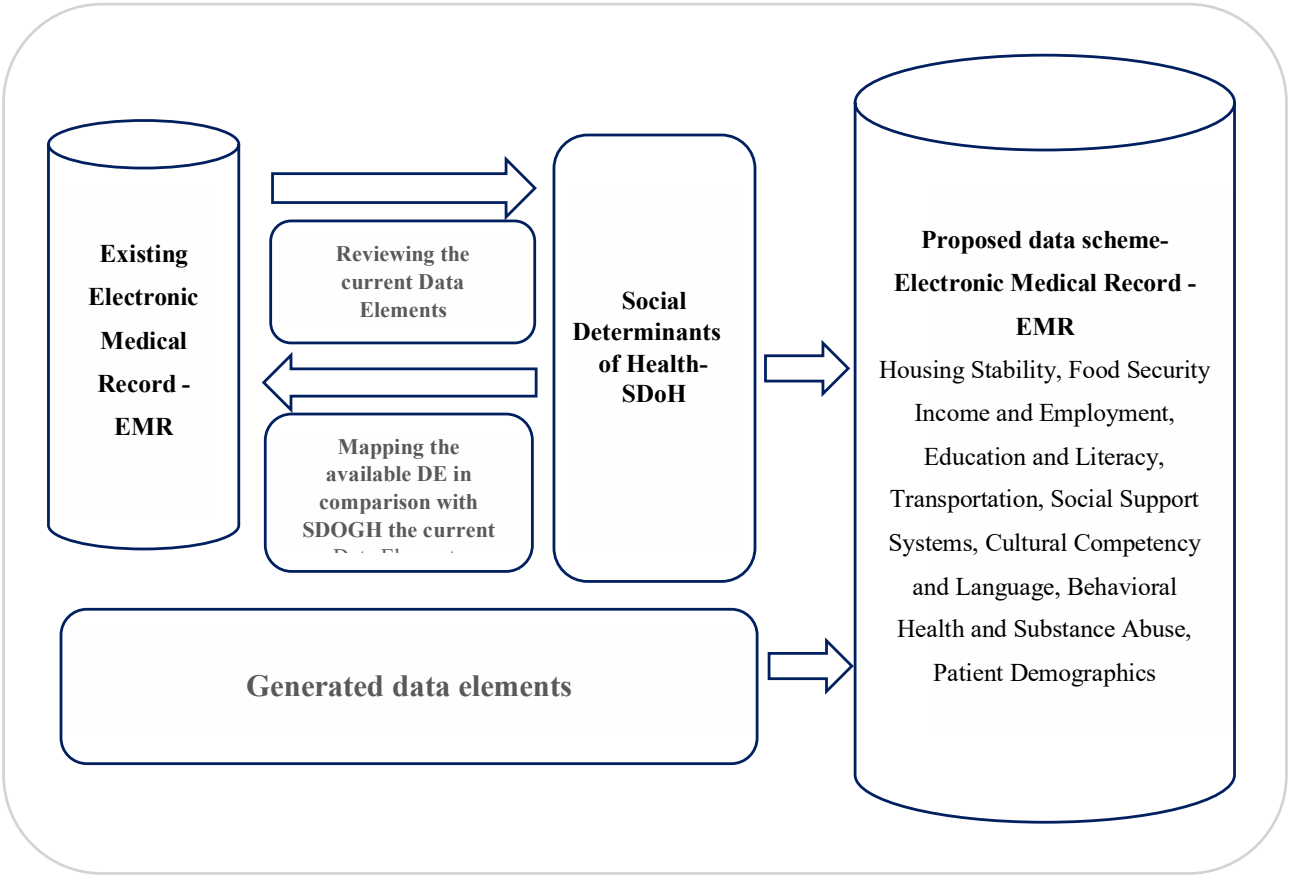


**Fig. 2:** Proposed variables for EMR design derived from social ecology of health model SDOH

## 4. Main Findings

**Table 1:** Example from Mapping process from EMR Registration screen

| Patient Info. | SDOH Availability |
|---|---|
| Patient # | 0 |
| Patient Name | 0 |
| ID | 0 |
| Age | 0 |
| Gender | 0 |
| Phone | 0 |
| Blood Group | 0 |
| Visit Info. | 0 |
| Visit # | 0 |
| Visit Date | 0 |
| Status | 0 |
| Referral Place | 0 |
| Sponsor | 0 |
| Agreement | 0 |
| Visit Type | 0 |
| ER Status | 0 |
| Agreement Status | 0 |
| Visited Place | 0 |
| Expected Discharge Date | 0 |
| Note | 0 |
| Referral Source | 0 |
| Mode of Visit | 0 |
| Receiving Patient No. | 0 |
| Physician | 0 |
| Ref. Physician | 0 |
| Department | 0 |
| Date | 0 |
| appointment type | 0 |
| **Total SDOH Data Elements** | **0** |

After reviewing over four hundred DEs across the EMR screens, a subset of SDoH DEs emerged, primarily encompassing variables related to patient addresses and health insurance types. The examination uncovered several notable findings: a notable absence of DEs dedicated to capturing and monitoring SDoH, an absence of a clear classification for downstream SDoH variables, and a concentration on medical and administrative DEs. Specifically, the medical-oriented variables centred on patients' medical, surgical, and medication histories, with a conspicuous lack of SDoH DEs in crucial sections like patient history, treatment plans, nurses' notes, physicians' notes, medical

consultations, and orders. Another noteworthy gap was observed in public health and SDoH aspects during patient admission and registration, where the focus was solely on insurance details, financial information, residency, telephone numbers, and general demographic information. The existing EMR metadata were predominantly oriented toward medical and economic aspects rather than encompassing public health DEs.

Table 1 unmistakably illustrates the absence of SDOH DEs across the reviewed screens in the EMR. The review extended to mapping the health data dictionary used for developing the metadata. Findings indicated that the metadata definitions were sourced from the Palestinian health data dictionary, established in 2005. However, these metadata were not internally defined or described within the EMR system. Furthermore, the metadata lacked a clear classification or taxonomy. Documentation of metadata existed minimally within the system, with no accompanying support documents explaining metadata definitions, purposes, codes, sources, uses, types, and future feasibility of interoperability. The primary results are organized based on the structure of metadata as outlined in the Palestinian National Health Data Dictionary, Version 2, MOH (2005), serving as the sole local source in Palestine (MoH, 2005). The main characteristics of EMR DEs were as follows: (1) **Metadata Definitions:** lack of clearly defined metadata elements used in the EMR system including lack of terminology, units of measurement, and any relevant codes. (2) **Meanings and Context:** lack of explanation of the meaning and significance of each metadata element. The considerations include a lack of information about how the data is collected, its clinical relevance, and any specific guidelines for interpretation. (3) **Relationships between Metadata Elements:** Lack of explanation of the relationships and dependencies between different metadata elements. This includes illustrating how certain elements are linked or how changes in one element may affect others—in addition, to providing clear information on how metadata elements interact with each other to support a holistic understanding of the data within the EMR system. (4) **Data Standards and Formats:** Lack of standards or formats for each metadata element, including information about the permissible values, data types, and constraints for each metadata element. (5) **Updates and Versioning:** Lack of documentation of any changes or updates made to the metadata definitions like maintaining a version history to track modifications over time. (6) **User Guidance:** Lack of guidance for users on how to interpret and use the metadata effectively. (7) **Accessibility:** The EMR documentation is Partially accessible to the stakeholders, including healthcare providers, administrators, and IT personnel.

## 5. Recommendations:

1. Develop metadata definitions, meanings and context, relationships between metadata elements, data Standards and formats, updates and versioning, user guidance, and accessibility documents.
2. Develop and incorporate the following SDOH Data Elements within the registration, medical history, and admission screens with the EMR:

**2.1** **Housing Stability:** Housing Type (e.g., apartment, house, shelter, camps), Living Conditions (e.g., overcrowded, safe), Change in Housing Status (yes/no), Date of Change in Housing Status, Housing Assistance Program Referrals.

**2.2** **Food Security:** Food Security Status (e.g., food-secure, food-insecure), Nutritious Food Assessment (yes/no), Automatic Referral to Food Assistance Program (yes/no), Nutrition Counselling Referral (yes/no).

**2.3** **Income and Employment:** Employment Status (e.g., employed, unemployed, underemployed), Monthly Income, Workforce Development Agency Referrals, Income-Related Health Disparities Trends.

**2.4** **Education and Literacy:** Education Level/ Literacy Level, Tailored Health Education Materials, Adult Education Program Referrals.

**2.5** **Transportation:** Transportation Barriers Data, Coordination with Transportation Services (yes/no), Missed Appointments Due to Transportation (yes/no).

**2.6** **Social Support Systems:** Social Support Network Details, Identified Need for Social Services (yes/no), Support Group or Caregiver Assistance Referrals.

**2.7** **Cultural Competency and Language:** Preferred Language, Cultural Background, Interpreter Services Requirement (yes/no), Cultural Competency Training Records.

**2.8** **Behavioural Health and Substance Abuse:** Behavioural Health Assessment Results, Substance Abuse Risk Assessment, Behavioural Health, and Substance Abuse Referrals.

**2.9** **Analytics and Reporting:** SDoH Dashboard, Patterns and Disparities Identification, Anonymized SDoH Data Sharing with Public Health Agencies.

**2.10** **Patient Demographics:** Patient Name, Date of Birth, Gender, Address, and Contact Information.

## 6. Discussion

The findings of this study underscore the critical importance of addressing SDoH EMR to enhance healthcare delivery and contribute to the achievement of SDGs. The identified gaps and recommendations offer valuable insights into optimizing EMR architecture for a comprehensive understanding of patients' social and economic contexts. Contrary to expectations, this study did not find enough SDoH DEs within EMR screens, it is only focusing on the patient address and health insurance type. This limitation suggests a narrow scope in capturing the multifaceted determinants influencing health outcomes. It is imperative to expand the range of data elements to encompass a broader set of SDoH,

as this will provide a more holistic view of patients' lives and facilitate individual interventions. Such limitations of SDOH might affect tracking the SDGs which is important for measuring the development in the country. It is difficult to explain this result, but it might be related to the lack of availability of an up-to-date health data dictionary since the available copy of the local health data dictionary is from 2005. Therefore, it is essential to incorporate relevant DEs into EMRs for the effective monitoring of health outcomes and individual interventions which lead to the improvement of SDGs. While we are addressing these benefits, it is important to consider the absence of such tracking mechanisms which hinder the healthcare system's ability to contribute effectively to improve health outcomes. The study highlighted the importance of categorizing the SDOH not only considering them in an ad-hoc manner, so the incorporation should consider the systematic and organized SDOH. Establishing standardized classifications of SDoH will enhance the consistency of data collection and reporting which will improve the comparison and analysis across diverse healthcare settings. Mapping the Social Ecological Model to EMR will provide valuable insight into various determinants, and emphasise the need for dedicated modules. These DEs should comprehensively capture information related to housing stability, food security, income, education, transportation, social support systems, cultural competency, and behavioural health. Incorporating such DEs aligns with the recommendation for dedicated EMR sections for lower-stream SDoH. Ultimately, the SDoH is a means, not the end, it's a means of achieving health equity and improving health equity. Incorporating SDHO DEs will improve capturing and identifying vulnerable population groups and connecting patients with social services, healthcare systems, and insurance systems as well.

Incorporating SDoH into the MER will improve referral systems between healthcare facilities and connect patients seamlessly. Designing the EMR architecture including SDoH will enable efficient and timely access to relevant resources, ensuring a holistic approach to healthcare that addresses broader socio-economic determinants. Furthermore, the proposed SDoH DEs will improve the real-time alerts and Prediction that enhance the identification of vulnerable populations. This proactive approach enables healthcare professionals to intervene promptly, addressing potential health disparities and promoting timely and targeted interventions. Finally, it's worth mentioning that the SDoH into EMR is an iterative process that ensures that the EMR system remains dynamic and responsive to emerging insights, technological advancements, and evolving global health priorities.

Several studies showed the effectiveness of incorporation of SDoH within the EMR i.e. A study conducted by Lofters et al. (2016) investigated the impact of including SDOH indicators in EMRs on cancer screening rates among vulnerable populations. They found that identifying and addressing social needs through EMRs significantly improved cancer screening rates among disadvantaged patients (Lofters, 2017). The deployment of the Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences (PRAPARE) in an EMR revealed valuable information on SDOH

prevalence and identified areas amenable to intervention (Yan et al., 2022). Additionally, studies have demonstrated that interventions targeting SDOH domains can lead to improved access to resources for patients, potentially addressing social needs and promoting health equity (Carrie et al., 2023). Furthermore, incorporating SDOH screening into the EMR through dashboards and alerts has enabled healthcare providers to consider SDOH factors in treatment planning, ultimately aiming to enhance healthcare outcomes and patient-provider relationships (Braja et al., 2021).

Future Research on Health Informatics and Social Determinants of Health (SDOH) is crucial for shaping future population health landscapes (Kelsey et al., 2022). By utilizing methods like data linkage and text classification, advancements in Health Information Systems (HIS) can capture a wide range of SDOH factors from various sources (Kelsey et al., 2022). Understanding the impact of SDOH on health outcomes is essential, as they play a significant role in disease development and health disparities (Xiaoyi et al., 2023). Studies have shown that addressing SDOH barriers at the county level can lead to effective interventions to reduce mortality rates from conditions like cardiovascular disease and opioid use (Pavani et al., 2022). Moreover, exploring the knowledge, attitudes, and practices of healthcare professionals toward Community Health Workers (CHWs) can help integrate strategies to mitigate SDOH and improve patient outcomes (Khan et al., 2022). Overall, research in this field can inform evidence-based policies, enhance health promotion efforts, and contribute to reducing health disparities and improving overall population health.

Health informatics plays a crucial role in enhancing medical research outcomes by enabling the evaluation of treatment effectiveness, identification of drug side effects, and facilitating data sharing for research purposes (Castro, 2009) (Peter et al., 2009). Biomedical informatics and health information technology (HIT) platforms are instrumental in collecting, managing, and utilizing healthcare information efficiently, thereby supporting evidence-based practice and research initiatives (Peter et al., 2009). Studies indicate that the adoption of health IT, such as electronic medical records (EMRs) and computerized physician order entry systems, can reduce mortality rates for severely ill patients, emphasizing the importance of technology in improving patient outcomes (McCullough et al., 2001). Despite challenges in EMR adoption, HIT tools like EMRs are designed to enhance care quality, reduce errors, and promote efficiency in healthcare delivery, underscoring the potential of health informatics to drive advancements in medical research and practice (Patricia et al., 2021) (Dan et al., 2010).

However, we can’t ignore the importance of using Health informatics solutions like EMR in capturing personalized health outcomes and their related risk factors and SDoH. Tailoring interventions based on specific patient characteristics and continuous tuning of treatments are essential for individualized care (Bih, 2022). In managing hypertension, individualized approaches are necessary, considering comorbidities like diabetes, chronic kidney disease, and cardiovascular risks, with different treatment goals for various patient groups, such as the elderly and young (Rajeev, 2023). These factors

collectively contribute to the customization of healthcare interventions to meet the unique needs of everyone, enhancing treatment efficacy and patient outcomes.

This study set out with the aim of mapping the availability of SDoH within the structure of EMR to improve health outcomes. The evidence proves that health outcomes improvement could be improved through individualized intervention rather than public and community interventions. Individualizing medication, treatment, and diagnosis in healthcare is a fundamental aspect of precision health and personalized medicine, aiming to tailor healthcare interventions based on an individual's unique genetic composition, lifestyle, and environmental influences (Bih, 2023). This approach enhances the effectiveness of treatment by predicting responses to therapies, reducing adverse effects, and improving patient outcomes (Piyali et al, 2022). Nurses play a crucial role in implementing precision health initiatives by providing tailored interventions that match patients' specific characteristics and adjusting treatments based on individual data (Bih, 2023). The development of personalized therapies is essential in addressing the challenges posed by genetic mutations, enabling the customization of medical treatments to suit the individual being treated (Arti et al, 2021). By leveraging advanced technologies and a deep understanding of molecular and genetic profiles, personalized medicine offers a promising avenue to improve healthcare delivery and patient well-being.

In future investigations, it is highly recommended to review the current design and architecture of the EMR. The design of the EMR system for better health policy interventions and Sustainable Development Goals (SDGs) alignment, is crucial to integrate embedded research methods (Abdul Ghaffar et al., 2017) and Health Impact Assessments (HIAs) (Oriana et al., 2029). By incorporating Health in All Policies (HiAP) principles, the EMR should focus on interoperability (Jens et al., 2020), behavioural economics for incentive design (Joan, 2023), and intersectoral strategies for health promotion and sustainable development (Joy, 2020). The EMR should facilitate data exchange between different health information systems, prioritize research relevant to health systems, involve policymakers in research processes, and address real-world implementation barriers. This comprehensive approach will ensure that the EMR system not only supports evidence-based decision-making but also contributes to achieving SDGs by promoting health equity, policy coherence, and stakeholder engagement.

In conclusion, the findings and recommendations underscore the need for essential reform of the EMR architecture through prioritizing SDoH. By embracing these recommendations, healthcare systems might contribute substantially to global health goals, advancing both individual patient care and collective efforts toward achieving the SDGs. The integration of SDoH into EMRs is not just a technological enhancement; it is a pivotal step towards fostering health equity and improving the overall well-being of populations.

## References

Abdul et al. (2017). Strengthening Health Systems Through Embedded Research. *Bulletin of The World Health Organization*, doi: 10.2471/BLT.16.189126

Ahmadi et al. (2022). Improving and Promoting Social Determinants of Health at a System Level. *The Joint Commission Journal on Quality and Patient Safety, 48*(8): 376-384. doi: 10.1016/j.jcjq.2022.06.004

Bih-O, L. (2022). [Precision Health and Nursing Care in the Digital Age]. doi: 10.6224/jn.202204_69(2).01

Bikash et al. (2022). Preliminary Considerations for Electronic Medical Record (EMR) in the Public Hospitals of Gandaki Province in Nepal. *Journal of General Practice and Emergency Medicine of Nepal*, doi: 10.59284/jgpeman42

Braja et al. (2021). Extracting Social Determinants of Health from Electronic Health Records Using Natural Language Processing: A Systematic Review, *Journal of the American Medical Informatics Association*, Vol. 28, Issue 12, pp. 2716–2727, https://doi.org/10.1093/jamia/ocab170

Carrie et al. (2023). Real-world Integration of the Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences Tool to Assess Social Determinants of Health in the Electronic Medical Record at an Academic Medical Center. *Digital Health*, doi: 10.1177/20552076231176652

Castro, D. (2009). *The Role of Information Technology in Medical Research*.

Dan, Belletti., Christopher, Zacker., C., Daniel, Mullins. (2010). Perspectives on Electronic Medical Records Adoption: Electronic Medical Records (EMR) in Outcomes Research. *Patient-Related Outcome Measures*, doi: 10.2147/PROM.S8896

Garg., R. (2023). Individualization of Hypertension Treatment: An Expert Review. *International Journal of Advances in Medicine*, doi: 10.18203/2349-3933.ijam20232150

Joan, et al. (2023). Behavioural Incentive Design for Health Policy, doi: 10.1017/9781009168113

Joy et al. (2020). Addressing Policy Coherence Between Health in All Policies Approach and the Sustainable Development Goals Implementation: Insights from Kenya. *International Journal Of Health Policy and Management*, doi: 10.34172/IJHPM.2020.212

Kelsey et al. (2022). Automating Data Collection Methods in Electronic Health Record Systems: A Social Determinant of Health (SDOH) Viewpoint. *Health Systems*, doi: 10.1080/20476965.2022.2075796

Khan et al. (2022). *Knowledge, Attitude, and Practices of Health Professionals Working in a Major Health Care System Regarding Social Determinants of Health (SDOH) and Community Health Workers (CHWs)*. medRxiv, doi: 10.1101/2022.02.21.22271311

Kim et al. (2022). Applying a Socioecological Framework to Chronic Disease Management: Implications for Social Informatics Interventions in Safety-Net Healthcare Settings. *JAMIA Open*, doi: 10.1093/jamiaopen/ooac014

Kollapally et al. (2022). An Ontology for the Social Determinants of Health Domain. *2022 IEEE International Conference on Bioinformatics and Biomedicine, BIBM 2022, Las Vegas, NV, USA* (pp. 2403-2410). doi: 10.1109/BIBM55620.2022.9995544

Lofters et al. (2017). Using Self-Reported Data on the Social Determinants Of Health in Primary Care to Identify Cancer Screening Disparities: Opportunities and Challenges. *BMC Family Practice, 18*(31). doi: 10.1186/s12875-017-0599-x

McCullough, Steve, Parente. (2011). *The Impact of Health Information Technology on Patient Outcomes*.

Ming et al. (2023). Evaluating the Impact of Social Determinants on Health Prediction. arXiv.org, doi: 10.48550/

arXiv.2305.12622

Oriana et al. (2019). Urban Health: An Example of a "Health in All Policies" Approach in the Context of SDGs Implementation. *Globalization and Health*, doi: 10.1186/S12992-019-0529-Z

Patricia, Whitley., Hossain, Shahriar., Sweta, Sneha. (2021). Impact of Health Information Technologies on the Quality of Healthcare Deliveries. doi: 10.4018/IJARPHM.2021010103

Pavani et al. (2022). The Relationship Between Social Determinants of Health (Sdoh) and Death from Cardiovascular Disease or Opioid use in Counties Across the United States (2009–2018). *BMC Public Health*, doi: 10.1186/s12889-022-12653-8

Peter et al. (2009). Biomedical Informatics and Outcomes Research Enabling Knowledge-Driven Health Care. *Circulation*, doi:10.1161/CIRCULATIONAHA.108.795526

Piyali et al. (2022). Personalized Medicine: An Innovation in Health-Care System. *Asian Journal of Pharmaceutical and Clinical Research*, doi: 10.22159/ajpcr.2022.v15i10.45460

Shane et al. (2023). Target-based Fusion Using Social Determinants of Health to Enhance Suicide Prediction with Electronic Health Records. *PLOS ONE*, doi: 10.1371/journal.pone.0283595

Shastri, A., Sawant, D., & Parmar, N. (2021). A Review on Personalized Therapies. *Journal of Pharmaceutical Research*, doi: 10.9734/JPRI/2021/V33I39B32188

Solar, O, & Irwin, A. A. (2010). Conceptual Framework for Action on the Social Determinants of Health. Social Determinants of Health Discussion Paper 2 (Policy and Practice).

Stephanie et al. (2023). Applying a Social Determinants of Health Framework to Guide Digital Innovations that Reduce Disparities in Chronic Disease. *Psychosomatic Medicine*, doi: 10.1097/PSY.0000000000001176

The Palestinian National Health Data Dictionary, Version 2, MOH (2005) as the only local source in Palestine.

Vale, M. D., & Perkins, D. W. (2022). Discuss and Remember: Clinician Strategies for Integrating Social Determinants of Health in Patient Records and Care. *Social Science & Medicine*, doi: 10.1016/j.socscimed.2022.115548

Walt et al. (2008). 'Doing' Health Policy Analysis: Methodological and Conceptual Reflections and Challenges, *Health Policy and Planning*, *23*(5), pp. 308–317, https://doi.org/10.1093/heapol/czn024

Weber, J. H., & ., Ho, J. (2020). Applying Bidirectional Transformations to the Design of Interoperable EMR Systems, doi: 10.1007/S41666-019-00065-0

Xiaoyi et al. (2023). Knowledge Mapping and Research Trends of the Social Determinants of Health (Sdoh): A Scientometric Analysis. *Reviews on Environmental Health*, doi: 10.1515/reveh-2022-0186

Yan et al. (2022). Effectiveness of Social Needs Screening and Interventions in Clinical Settings on Utilization, Cost, and Clinical Outcomes: A Systematic Review. *Health Equity, 6*(1):454-475. doi: 10.1089/heq.2022.0010. PMID: 35801145; PMCID: PMC9257553