

Social Determinants of Health: Integrating Analytics and Technology in Healthcare Systems

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Abstract: *The condition that covers the person's life like the birth, childhood, profession, age, and the health conditions are all included in Social Determination of Health (SDOH). The non medical factors that improves the patient health and care by targeting the different factors like the economy, education, social services, and environmental conditions, are very important and healthcare industry is including SDOH in their systems. The importance of analytics has improved after 2018, as the technology is growing rapidly and the information in the industry of healthcare is increasing day by day. The new technology that includes the machine learning, AI, and other innovative procedures allows the healthcare industry to get the idea of any upcoming health issues and trends by using the information form these technologies. The most important thing is the analysis of the data to get the idea of the future health requirements and to overcome diseases with improved medication. Due to the implementation of SDOH in Florida is affected by the rules and regulations, challenges that are due to socioeconomic changes, and the need of strategies and involvement of stakeholders. The base to get involved with the SDOH is all set all thanks to government, plans and strategies that are related to healthcare and the combine working between the agencies that are involved in government, healthcare providers, and organizations that are working for the community are very important. The analytics an important part while dealing with SDOH by covering all the risks that are associated with economy, stability, education, and healthcare context. By using these analyses, the stakeholders can develop plans and strategies that are related to upcoming issues that are identified, to provide the best of facilities in the field of healthcare.*

Keywords: Social Determinants of Health, healthcare analytics, machine learning, AI in healthcare, Florida healthcare strategies

1. Introduction

In the past few years the idea of Social Determinants of Health (SDOH) has caught the attention of public in the subject of health discourse. The SDOH are the non - medical factors that have huge impact on the inventions of health - related concepts. It consists of huge amount of situations that are related to a person's birth, growth, life, profession, and age. Such information have an huge impact on the person's health and life, apart from this it contibutes as the data for the healthcare. The definition of SDOH by World's Health Organization is "the conditions in which people are born, grow, live, work, and age, and the wider set of forces and systems shaping the conditions of daily life. " The forces that are mentioned in the definition can be the economic plans, the rules and regulations and any policies. The SDOH has a very high scope as it covers different conditions such as the income, status, education, and the environment that has a physical effect on the human being. The key feature of the Social Determinants of Health consist of different factors that affects the health of an individual. For example the economic stability is very important for the person's health, as the persons with higher wages have the better facilities to the healthcare, food, and safe residential property. The profession of the person also plays a very important role as it will gave less stress and provides the job security leading to a better health condition. Same as the persons with the low wages deals with the stress and does not have the facilities to the basic healthcare and liabilities [1].

1.1 History and Background on the Role of Analytics in Healthcare Since 2018

By the year of 2018 the impact of analytics in the field of healthcare has shown a rapid growth and changes. As the technology is growing the information regarding the healthcare is increasing resulting in the improved solutions

and plans. The results of analytics can lower the cost of medications, and improve the quality of healthcare delivery. During this year the combination of different forms of analytics that includes the descriptive, predictive, and descriptive analytics into different fields of healthcare [2].

Early Adoption and Technological Advancements

After 2018 the healthcare industries started to recognise the importance of data, information, and analytics. It was the time in which the healthcare industry witness a rapid change in the procedures after adopting the advance analytics. There were different factors that helped in the progress that includes of electronic health records (EHRs), the advanced version of machine learning and artificial intelligence (AI), and the focus on the importance of value - based care.

The improved version of EHR provide such valuable data that it can help with the healthcare industry. The example for this is EHRs because at firsts they were only used to document about the patient and to generate the bill but now it is also being used to for the clinical policy making and to get better with the tasks. The function to deal with large amounts of data allowed the healthcare providers to identify the patients, know about the diagnosis and to carry on with the treatments [3].

Descriptive Analytics: Understanding the Past

The analysis of the patient history is known as the descriptive analytics, that what kind of treatments the patient has gone with. This approach is used in the healthcare industry to make reports, monitor key performance indicators (KPIs) and to hunt down the upcoming issues.

For the improvement of operational efficiency the descriptive analytics approached was being used from 2018. The examples include the admission and discharge of the patients, the use of hospital beds to maximise the usage, low waiting

time, and to enhance the patient flow. It also leads to low admission rates in many healthcare centers. The descriptive analytics were also used to track down any infectious diseases, cover and see the vaccination charges, and to track any health - related issues with public. This approach can be used to overcome the challenges that are related to rules and regulations or design of the upcoming health trends [4].

1.2 Factors that lead to SDOH implementation

The implementation of Social Determinants of Health (SDOH) that is starting in Florida is the mixed version of policy makers, socioeconomic issues, and the requirements healthcare system and engagement of primary school. Both of these states have combined SDOH with their strategic and planning sector, the state Health Improvement plan (SHIP) and Community Health Improvement Plans (CHIPS) in Florida. The both of these plans deals with the enhancement of addressing factors like the residence, education, and economic stability. The socioeconomic issues which include the low wages, residential issues, and poor health and education are also covered in such plans [5].

1.3 Social Determinants of Health (SDOH) and their Affiliation with Medicare Programs

It is all about the job medical factors that can effect the health results, it consists of other conditions like the birth, upbringing, profession, and age. The SDOH is not a medical system but it can be combined with other medical systems to improve the results and the efficiency of the system. The base of SDOH is not understand that the health depends on other functions as well apart from the medical needs and practices. The socioeconomic factors that we discussed above like the standard of living of the patient, education and the environment also effects the person's health. We have to address these factors to overcome the future trends in healthcare industry as well as to improve the health of the nation [6].

Integration of SDOH with Medicare Programs

The federal insurance that is related to health, for the people of older age and some young persons who have diabetes, such insurances have understood the factors that affect the person's health that are nonmedical factors. They have combined their systems with SDOH to get the broader aspects of their clients history. The Medicare Advantage (MA) plans, that are offered by private insurance companies, were the first to this SDOH system along with their system and provided other facilities for free like the transportation, scheduling medical appointments, delivery for the meal, and home nursing for the patients who are dealing with the acute health issues. The other programs like the Accountable Care Organization (ACOs), that have the number of doctors, hospitals, and healthcare workers are registered helps to lower the cost of visiting the hospital and using the emergency beds [7].

1.4 Social Determinants of Health (SDOH) and the Role of Analytics

Economic Stability

The economic stability consists of the factors like the salary, job, and anything that is related to finances that can effect the

health of the person. Analytics plays a very important role in the world of healthcare as it shows the connection of these factors and there effect on health. By achieving information like the age, job, and salary can help to predict the future health trends and to get a better idea of the upcoming risks [8].

Education

Education also effects the person's health as it defines their future job, knowledge, and expertise. Analytics can study such factors that are associated with the age factor to get the future trends that are related to health. The predictive models are used to study education related issues like the schooling graduation, and skills. As such models are capable of predicting the future health issues and requirements. For example, this approach can sense or track down the upcoming issues that can be related to education or any factors like stress [8].

Social and Community Context

The factors that are associated with the social and community are the social reliance, social circle, and exposure to the violence. Such factors can bring many health related issues and only analytics can predict the situation by going through the data that is related to social and community issues. The other solution to such issues is to make programs or plans to identify and improves the relationships and networks that are formed through IT. Community centre can play a very important role in consulting to reduce the effect of the factors and crime rates [8].

Health and Healthcare

The quality of healthcare is very important. Analytics can improve the healthcare delivery by finding out the flaws, looking forward to the requirements of the patient, and by improving the resources. By going through the information that data can be generated that has no to least amount of healthcare facilities. In this situation predictive analytics can help to fulfill the needs of the patients' requirements and the distribution of the resources [9].

Neighborhood and Built Environment

The environment that a person is living in effects the person's health so much that it can lead to some serious health issues. Other factors that are associated with the environment and neighbourhood is the food, transportation and residential property. By using the technology like Geographic information systems (GIS) analytics can pin down some areas that has the low maintenance system and have less facilities to live a basic life. Predictive models can help to predict the future of such areas and the changes that can be made after the improvement in the environment [9].



Figure 1: Social Determinants of Health (SDOH)

1.5 Integrating SDOH Data into Healthcare Using Data Visualization Tools Like Power BI

The combination of Social Determinants of Health (SDOH) information in the field of healthcare industry is very important to enhance the results of the patients in and keeping in touch with the health disparities. The data visualization tool that is very important for the process to integrate the systems like the Power BI, it helps the healthcare professionals to analyze, interpret, and test out huge data power beer is the tool that helps in the creation of intuitive, interactive dashboard and generate reports that have the ability to turn raw data into a functional inside. The very first step of integration of the system into healthcare industry is to collect data from different sources. The sources can be the Electronic Health

Records (EHRs), public health database from any social service agencies, or any kind of community surveys. The data should cover different factors like the salary, profession, housing situation, employment status and the access to the facilities of the healthcare [10].

The data that will be collected would be cleaned and interpret for the analysis. The cleaning process contains the standardizing the data format, check the values that are missing, and making sure that the data is correct. The Power BI can connect multiple data resources and facilitated the data integration by using its data transmission capabilities. The usage of tools like Power Query to clean and prepare the data for visualisation. Power BI's also have a feature that allows the users to create different types of visualisations that can display the data in meaningful ways, this would include the maps, bar charts, line graphs, and other visual factors that will present the data in more analytical way. While utilising the Power BI's abilities, healthcare providers can visualise the geographical disparities in results and SDOH factors like, the heat maps that shows the areas with high poverty level, that have no education or have no to limited healthcare facilities this will help them to identify the areas that require more attention. The line graphs and the time series graphs that will be used by the Power BI to track the changes that are made in SDOH by making it more useful for monitoring the results of applied policies. Such as showing the results of reduction in the admissions in the hospital. The scatter plots and the bubble charts will help them to identify the correlation between the SDOH factors and the results of the health sector this will help the health care professionals to get the idea about how the non medical factors like employment literacy can be the start of any diseases.

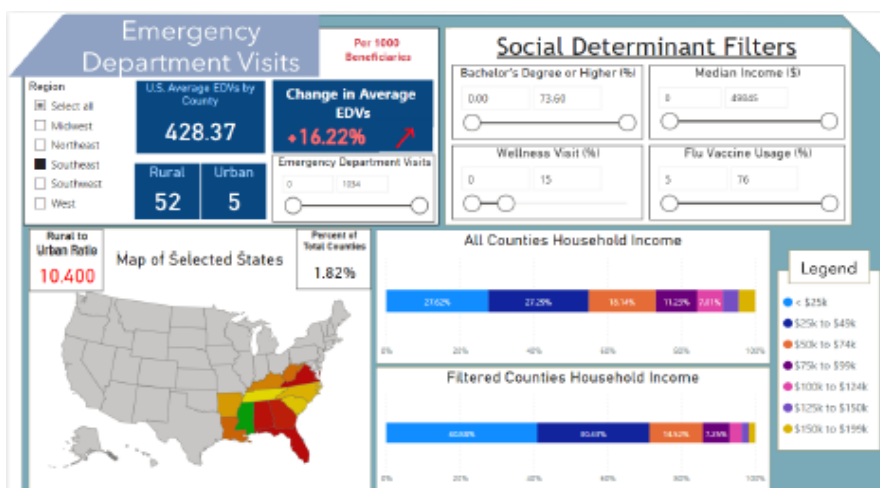


Figure 2: Example of SDOH Data visualization on Power bi

The key ability of Power BI is to design attractive and interactive dashboards and reports by combining multiple visualization factors, that allows the users to see some specific details and customise the reports according to their needs. The interactive dashboard do have a patient risk profiling feature, that is generated according by combining the SDOH information and using some filters and slices to categorise the patients according to their salary, residential issues or any educational factor. This categorization will help the healthcare providers to prioritise the higher risks groups. The dashboards that are generated by the Power BI also highlight

the areas that need more resources like the food or any health facility [11].

The other factor that plays a very important role in the integration of the SDOH into the healthcare sector using the Power BI is Big Data. The huge data that is generated by the Electronic Health Records (EHRs), public health databases, and any social service can be used for the betterment of healthcare industry. By using the Power BI this data can be converted into a meaningful data, that will help the healthcare providers to get the idea of upcoming trends and patterns. This will also allow the healthcare providers to prioritise the

patients according to different factors according to the risk profiling feature and with the help of SDOH information. Power BI will use the slicing techniques that categories the data according to their salary, residential issues, and literacy rates. The other thing that can be done by integrating the SDOH data into the healthcare department by using the Power BI can produce more advanced analytics and machine learning to form predictive models using the Power BI [11].

2. Conclusion

The research in the "Understanding SDOH in the Context of Predictive Analytics" shows the effects of combining the SDOH with the predictive model to improve the quality of healthcare industry. By depending on the data gathered on the economic stability, profession, social life, health facilities, environment, and other normal things that people believe do not affect human health that much. This combination of SDOH and the predictive model can bring positive impact on the overall humanity. The predictive approach not only improved the healthcare industry but also produced a comprehensive and efficient approach to the issues related with healthcare. As the technology is growing rapidly the data is gathering in huge amount, this data can be used by SDOH to serve the humanity and grow as the technology is growing. This study also covers the importance of working and considering the technical support in the field of healthcare industry to overcome the challenges and set a future trend.

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