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Improving Preparedness in Epidemic Healthcare

Using Data Science

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***Abstract*—** Dengue fever or dengue is a virus spread through mosquito bites. This virus present itself in the form of fever, headaches, vomiting, nausea and in some cases it can lead to death. Since this illness is carried by mosquitoes. By forecasting the spread of this disease the health agencies can better organize their preventive measures such as vaccination and provide information to the public about this illness. Interactive information visualization and visual analytics methods will bring profound changes to personal health programs, clinical healthcare delivery, and public health policymaking. This paper offers several challenges for data visualization and analytics researchers. The problems and challenges are aligned a roadmap for Predictive, Preemptive, Personalized, and Participative Healthcare Systems to improve the preparedness in epidemic healthcare for future.

Keywords- *analysis; epidemic visualization;*

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I. INTRODUCTION

Forecasting the spread of disease the health agencies can better organize their preventive measures such as vaccination and provide information to the public about this illness.

Data Visualization: Analyzing the way the data behaves can give us a glimpse into what variables are needed for an accurate forecast as well as how what to expect from the Prediction Model. Visualizing the dataset we can see the pattern of dengue fever cases over time.

The Dengue data was collected from drivendata.org. The data includes disease data from San Juan, Puerto Rico and Iquitos, Peru. The dataset contains four variables regarding the time of diagnosed cases of dengue fever for both cities.

Evolving health informatics systems promise to revolutionize health and health care programs worldwide. However, turning this hope-filled vision into a reality will take an enormous effort from thousands of designers, analysts, software engineers, usability specialists, and medical professionals. While there are many challenges to overcome, this paper focuses on the central role of data visualization and analytics processes. These algorithms, interactive designs, and analytic processes support exploration, operating, insight discovery, professional association, and clear presentations to patients, clinicians, policy makers, and for the general public.

The US Institute for Medicine's 2011 Report focused on improving patient safety through "cross-disciplinary research" on "user-centered design and human factors applied to health IT." The report sharply noted that "Data visualization is not as advanced in parts of clinical systems as compared with other scientific disciplines."

II. OLD METHODS AND TECHNOLOGIES

Over most of the past century, medical imagery technologies based on x-rays, and then later technologies such as CT scans and MRIs have changed the medical care by providing accurate 3D visualizations that highlight problem areas effectively. Other successes include visualization-supported medicinal planning, tele-surgery, pharmaceutical drug discovery, chem-informatics, and genomic expression analysis research. In addition, data visualization is amplifying the benefits of health informatics databases and networks by dramatically expanding the capacity of patients, clinicians, and public health policymakers to make better decisions.

Introduced framework for analyzing health statistics technologies, under the term "Health 2.0". This term suggests usual strategies that are web-based, and inclusive. These strategies employ social media, private sensors, mobile devices, as well as data visuals and analytics integrated with advanced statistical methodologies.

1) *Personal Health Information:* Individuals will continuously collect information about their own health practices, while monitors and sensors will enable them to better understand their strengths and weaknesses using this system.

2) *Clinical Health Information:* An Electronic Health Record (EHR) systems become pervasive patient care can improve and as a complementary use of this data will provide valuable insights into treatment patterns of diseases.

3) *Public Health Information:* Federal and state governments collect large volumes of public health data from hospitals that can enable people to make more reliable decisions.

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III. WORKING OF TABLEAU

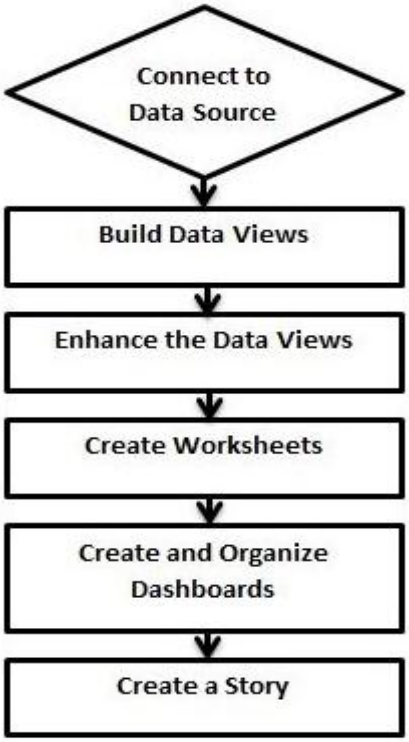

Figure1. Flowchart representing working of Tableau

- In exponential smoothing, recent observations are given relatively more weight than older observations. These models capture the evolving trend or seasonality of the data and extrapolate them into the future. The result of a forecast can also become a field in the visualization created.
- Tableau takes a time dimension and a measure field to create a forecast.

IV. STEPS INVOLVED

A. Data Collection: This step includes the process of collecting data through different websites like data.gov.in, kaggle, world health organization that provides data for free to access and to make use of it in a better way.

B. Data manipulation: In this, we used R programming to manipulate the data like removing the null values, improper indexing etc into the data set.

C. Data representation: Using tableau or weka or R we can recognize the pattern or trend that the data follows, and it can be presented in the form of graphs.

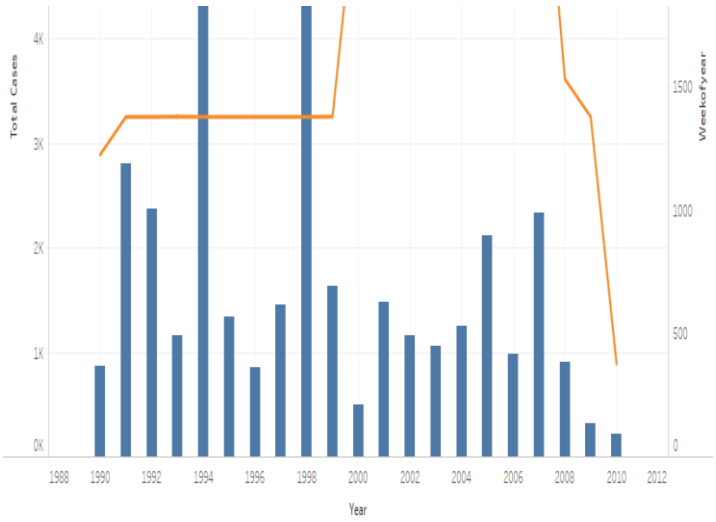

Figure2. Representation of total cases vs. year vs. weeks of the year

D. *Prediction:* Here comes the last step of the process that includes prediction using the past data collection, I represented this using Tableau which uses exponential smoothing model where the software takes the average of the past values to predict future ones.

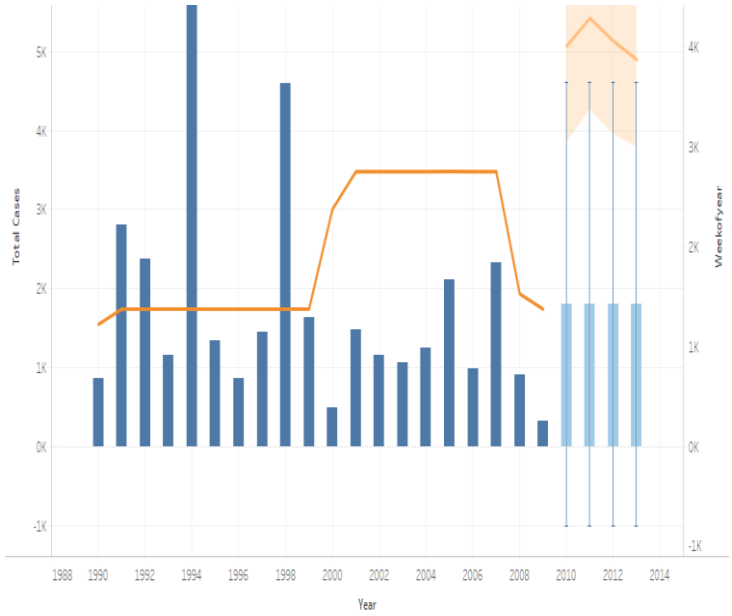

Figure3. Graph predicting the total number of cases according to the upcoming years.

V. CONCLUSION

This paper shows the previous methods opted and new methods that can be helpful for preparing hospitals while the spreading of these diseases. Their advantages and disadvantages are studied along with its implementation of data prediction.

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VI. ADVANTAGES

- *Advanced Patient care:* Electronic health records help in collecting demographic and medical data such as lab test, clinical data, diagnoses, and medical conditions, which helps healthcare practitioners to provide quality care.
- *Improve Operational Efficiency:* Healthcare companies use big data as a part of their business intelligence strategy to research about historical patient admission rates and to analyze the staff efficiency.
- *Finding a cure for diseases:* A particular medication seems to work for some people but not for everyone, and there are many things to be observed in a single genome. It is impossible to study all of them in detail at once. But big data can help in uncovering unknown relations, hidden patterns, and insights by going through large sets of data.

VII. DISADVANTAGES

- Privacy Threat: One of the strongest threat relating to data is the lack of privacy, especially when it comes to confidential medical records.
- Replacing Doctors: The growth of big data could potentially undermine doctors and leave patients turning to technology for answers instead of using a licensed doctor

VIII. APPLICATIONS OF DATA SCIENCE IN HEALTHCARE

A. *Genomic Research:* Enabling Genomic Analysis on large scale of data in the category of Data Analytics and Visualizations. Providing the backbone for precision systems for healthcare by unifying research & clinical storage mechanism

B. *Hospital Quality and Patient Safety:* Hospital quality and patient safety in the ICU - The focus is on integrating bedside medical device data into sensitive algorithms that detect plummeting vital signs hours before humans have a clue.

C. *Population Health Management, Risk Analysis, and Prevention*: Healthcare predictive analytics help with proactive care towards their patients' needs. "Targeting patients based on their past behaviors can help to predict future events, such as a diabetic ending up in the emergency room because he did not refill his medication.

D. Reducing Hospital Readmission by doing Preventive Care.

E. Self-Evaluation of System and Diseases.

REFERENCES

[1] Kielman, J. and Thomas, J. (Guest Eds.), Special Issue: Foundations and Frontiers of Visual Analytics, Information Visualization, Volume 8, Number 4, (Winter 2009), 239- 314. 2. Ward, M. O., Grinstein, G., and Keim, D. A., Interactive Data Visualization: Foundations, Techniques, and Application, A. K. Peters, Ltd (2010). 3. Shortliffe, E. H. and Cimino, J. J. (Editors), Biomedical Informatics: Computer.

[2] *Applications in Healthcare and Biomedicine: 4th Edition, Springer, New York (2013).*

[3] Hesse, B.W.; Hansen, D.; Finholt, T.; Munson, S.; Kellogg, W.; Thomas, J.C., Social Participation in Health 2.0, IEEE Computer 43, 11 (Nov. 2010), 45-52. doi: 10.1109/MC.2010.326 5. Institute of Medicine, Committee on Patient Safety and Health Information, Health IT Patient Safety: Building Safer Systems for Better Care, National Academies, Washington, DC, 2011. Available online at: http://www.nap.edu/catalog.php?record_id=13269 6.

[4] Consolvo, S., Klasnja, P., McDonald, D. W., Avrahami, D., Froehlich, J., LeGrand, L., Libby, R., Mosher, K. and Landay, J. A., Flowers or a robot army?: encouraging awareness & activity with personal, mobile displays.

[5] Proc. 10th international conference on Ubiquitous computing (UbiComp '08). ACM, New York (2008), 54-63. 7. Schumacher, R. M.; Lowry, S. Z., NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records (NISTIR 7741), Gaithersburg, MD (Nov 2010). 8.

[6] Rind, A., Wang, T., Aigner, W., Miksch, S., Wongsuphasawat, K., Plaisant, C Shneiderman, B., Interactive Information Visualization to Explore and Query Electronic Health Records, Foundations and Trends in Human-Computer Interaction, Now Publishers, 5, 3 (to appear, 2013). 9.

[7] Wongsuphasawat, K., Gomez, J. A. G., Plaisant, C., Wang, T. D., Shneiderman, B., and Taieb-Maimon, M., LifeFlow: Visualizing an overview of event sequences, Proc. ACM SIGCHI Conference, ACM Press, New York (May 2011), 1747-1756. 10.

[8] Oliveros, S., Eich-Miller, H., Boushey, C., Ebert, D., and Maciejewski, R., Applied Visual Analytics for Exploring the National Health and Nutrition Examination Survey, Hawaii International Conference on System Sciences, 2012 http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6149111 11. Afzal, S., Maciejewski, R., Ebert, D., Visual Analytics Decision Support Environment for Epidemic Modeling and Response Evaluation, IEEE Conference on Visual Analytics Science and Technology (VAST), 2011.

[9] http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=06102457 12. Sopan, A., Noh, A., Lee, G., Rosenfeld, P., Karol, S., Shneiderman, B., Community(2011)

[10] Health Map: A geospatial and multivariate data visualization tool for public health datasets, Government Information Quarterly 29, 2 (2012), 223-234. 13. Christakis, N. A., Fowler, J. H., Connected: The Surprising Power of Our Social *Networks and How They Shape Our Lives -- How Your Friends' Friends' Friends Affect Everything You Feel, Think, and Do, Back Bay Books, Boston, MA (2011). 14. Hansen, M., Shneiderman, B, and Smith, M. A., Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann Publishers (2011).*

ISSN: 2454-4248
66 – 69

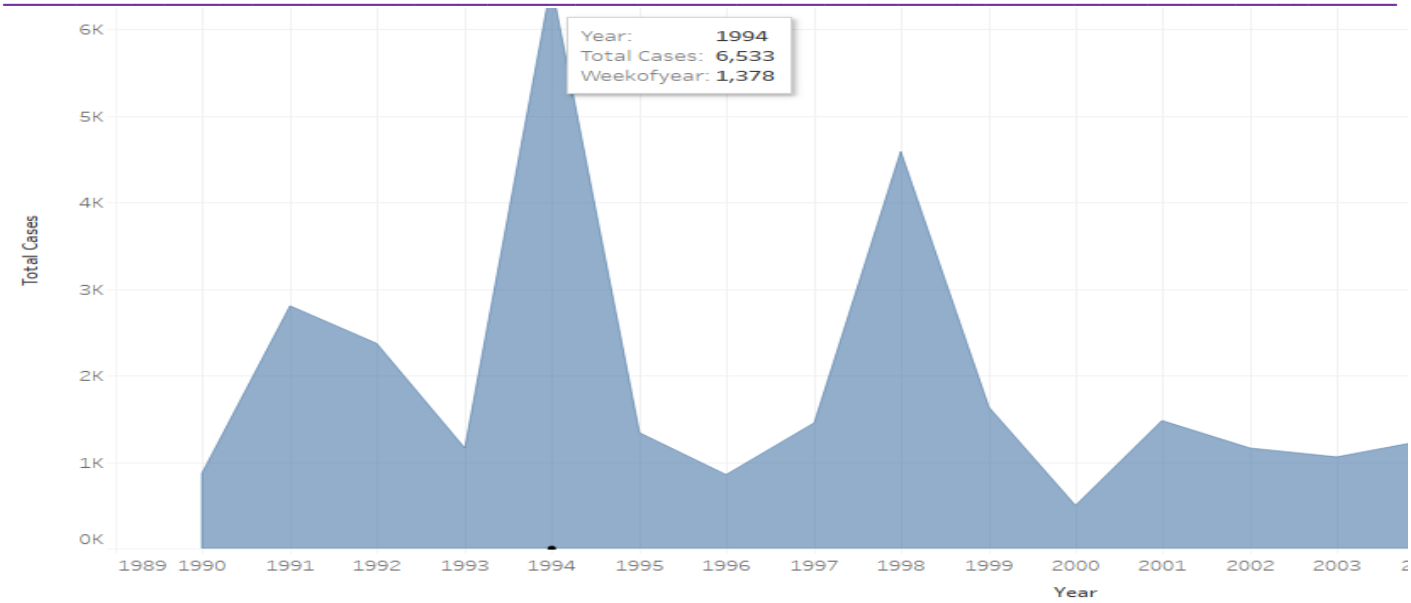

Figure 3. Graph representing a total number of cases vs. Year