Studying the Way People Rate Their Physicians *Online*

[Extended Abstract]

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1. ABSTRACT

Many patients turn to rating websites to share their experience with a health care provider which can provide insightful information for prospective patients, however researchers have speculated that some reviews may sabotage health care provider images. In this research, we investigate the relation between health care provider reviews and health outcomes. We selected two different health care domains - prostate cancer and obstetric care - that impact men and women respectively. Then, we collected reviews via Google APIs from five states with the highest mortality for the specific domain and five states with the lowest mortality. We qualitatively analyzed the reviews using the TAMS (Text Analysis Markup System) analyzer where we found states with highest prostate cancer mortality rates had less information about the health care providers in comparison to states with lowest prostate cancer mortality rates.

2. INTRODUCTION

With an increase in the number of people investigating health related issues online, [5] online rating sites have become more influential then ever. These internet rating sites give patients an opportunity to rate a health care provider they know or visited. Rating websites can benefit both physicians and patients because the ratings provide patient perspective that health care providers can use to improve their practice, and prospective patients can choose a suitable physician by analyzing the reviews and ratings posted online. [7] If online ratings reflect patient care and health care provider's treatment, are there differences in how patients rate health care providers when outcomes are not similar? Health care providers argue that these reviews may not represent an accurate appraisal of surgeon quality. [4] For example, the incidence is higher in Mississippi and Louisiana where the prostate cancer mortality rate is greater than 24%, than Colorado and Alaska, where the rate is under 20%. [3] Does the type of health care people receive make any impact on the mortality rate ? Are there any differences in the opinions of people who receive their health care in states with high ma-

ternal and prostate cancer mortality rates compared to people who live in states with low maternal and prostate cancer mortality rates? In this study, we investigate if health care provider ratings give insights into how health care providers treat their patients, which may impact their willingness to be seen for screening and treatment. By studying the ratings and reviews of the patients from different states we can get a brief idea of the type of health care they receive.

Researchers have analyzed the online ratings of health care professionals and found that it is difficult to identify reviews based on actual experiences [10]. In addition, with the exception of [8, 9], most research on health care professional ratings have not documented the locations where the reviews were collected. This is important because outcomes and care may vary based on location. We analyzed ratings and reviews from Google for Urologists and Obstetrician-Gynecologists in states with high prostate cancer mortality rates and high maternal mortality rates respectively. To this end, we used an Application Programming Interface (API) to collect information about the health care provider, patient demographics, reviews,ratings and metadata.

By studying the way people rate their health care providers online we were able to conduct a qualitative analysis of how patients perceive their care from health care providers in areas with high and low incidence of male-oriented and female-oriented health conditions. We built a work flow that utilize APIs to collect, store, and analyze health care provider reviews. Most importantly we will create a discussion of how incidence may impact patient's treatment. Also, the research will help to figure out the relation of patient's treatment to their willingness to be diagnosed again.

3. RELATED WORK

Online health care provider rating websites play a vital role when it comes to choosing a suitable health care provider. [4]. There have been debates on the issue of whether patients should be allowed to rate their health care providers online. A study by Emmert showed that patients are highly influenced by the information presented on an online rating site [2]. Physicians argue that the health care providers should not be reviewed like the grocery stores or restaurants are reviewed online [11]. There are not any means to figure out if the review is posted by a real customer or someone who wants to rip off the physician [7]and in some cases even the real review doesn't reflect the quality of the health care provider [11]. But, policy makers believe that these sort of

rating websites help to create a transparency in health care sector by circulating enough information about the health care providers [6].

Study shows that most reviewers give good ratings to their health care providers. Researchers analyzed the reviews of 23 health care providers in 25 major U.S. cities from 10 of the most used doctor rating sites based on Google Trend data. They found out that more than 65% of the reviews were positive [8]. It is found that the people who write reviews are comparatively more educated, younger and healthier then the ones who don't [9]. When it comes to health care providers, younger physicians without malpractice claims and physicians who graduated from top -50 medical schools had somewhat higher ratings then the other physicians [6]. Rosenbaum found that negative reviews can adversely impact the practice of highly qualified cardiologists [10], thus review accuracy and ratings are important to patients *and* health care providers.

4. METHODS
We have divided the methods into two sections, in the the first section we will talk about the types of research that has been done so far and our data collection process. In the second part we will explain how we analyzed the collected data.

4.1 Review Selection
- Give overview of two areas - we selected a women's health issue and a men's health issue that was intensely episodic in nature. In addition, the care would be personal and require a hospitalization with invasive procedures.

4.1.1 Prostate Cancer
We obtained the state wise and county wise data related to prostate cancer from two websites: jamanetwork.com and cdc.gov. JAMA(Journal of Medical Association) is a medical journal that publishes research and reviews. cdc.gov is a website of center for disease control and prevention which is a national public health institute of United states. We collected county wise data of highest and lowest prostate cancer mortality rate in USA using the data from . We used google to collect the list of cities in each county. Then, we used google places API to get the total number of urologists in each cities.

But, the total number of reviews that were collected using county wise data was insufficient, we decided to collect state wise data instead. We used the website cdc.gov to obtain the data for prostate cancer mortality rate in USA. We selected ten states that had 17.8 or lower prostate cancer mortality rate and other ten states that had a 21.1 or higher rates.

4.1.2 Obstetrics
The United States has one of the highest maternal mortality rates for a developed country in the world [?]. In order to further examine how these rates were affected by the patient's perception of their treatment, we used the CDC vital stats mortality database to find the states with the highest and lowest maternal mortality rates [?]. Massachusetts was the lowest with a rate of only 5.6 deaths per 100,000, while New Jersey had the highest maternal mortality rate; 30.2 [?]. Due to the two states drastically different rates but close geographical location, they were chosen for further review.

We then used the Google Places API to systematically search for Ob/Gyn's throughout the state by using a variety of latitudes and longitudes with a 10,000 meter radius. We then accessed the details of the locations, including reviews, for each of the doctors.

4.2 Data Collection
The following tables represent the work that has been done so far by other researchers in this field. We found out that most of the researchers used websites like Yelp, RateMd, Healthgrades to analyze the ratings and reviews of the health care providers. Some researchers conducted cross sectional survey where as some used data from non-profit news room like Propubica. When it comes to type of research most of the researchers conducted both qualitative and quantitative analysis, few of them did qualitative analysis. None of the papers mentioned how the data were collected. Most of the researchers were focused on common health care providers which may or may not include all specialities and very few researchers were focused in categorizing the data according to specialization of health care providers. All the data are included in the table below.

We collected the ratings and reviews of the health car providers posted by their patients. Reviews were collected from two popular rating websites Google and Yelp. Our research solely is based on diseases like Prostate cancer and maternal mortality that are specific to one sex. We used the data from the website of Center for Disease Control(CDC) [3] and selected the ten states each for highest and lowest prostate cancer mortality rates and maternal mortality rates. We used the Yelp API and Google API to access the information from Yelp and Google. Google allows us to pull 5 reviews for each business. [1] Yelp also has some restrictions when it comes to allowing the users to access their data. Yelp only allows three reviews and each review is restricted to 160 characters [12].Then, we wrote different python scripts for Yelp and Google that would pull the ratings and reviews of health care providers and write them in a csv file. Scripts were written in such a way that they would only pull the information of those health care providers that have at least one rating and were the correct specialty.

4.3 Data Analysis

Qualitative Analysis

- We developed a code book to analyze the collected reviews.
- Codes are divided into two parts regular codes and context codes.
- Context codes are divided into two parts regular context codes and universal context codes.

Paper	Google	Facebook	Yelp	RateMD	other
Kadry et al. [8]			*	*	healthgrades,vitals, checkbook, angieslist, ratemd
Lopez, et al. [9]			*	*	
Gao et al. [6]				*	Physician's database of Virginia
sciencedaily et al [4]				*	vitals, health grades
Emmert et al. [2]					cross-sectional survey
Sorrel et al. [11]			*		
Jain et al. [7]					vitals
Gebauer et al			*		propublica
Rosenbaum et al. [10]					probublica
Fox Fox et al [5]					

Table 1: Sites Used

Paper	Qualitative Analysis	Quantitative Analysis	API	Web Scraping
Kadry et al.[8]	mostly positive ratings	average rating = 77%	-	-
Lopez et al. [9]		61% positive and 39 % negative	-	-
Gao et al. [6]	most reviews were positive	46% got 5/5 12% got below 2	-	-
sciencedaily et al. [4]	female surgeons and surgeons with affiliation gor good ratings		-	-
Emmert.[2]	more people are using doctor rating sites in Germany	23% of internet users look for physicians online		
Sorrel et al. [11]			-	-
Jain et al. [7]	most people are positive on using internet for health purpposes		-	-
Gabeuer et al.	physician rating sites should be more systematic		-	-
Rosenbaum et al. [10]	there is no transparency in online rating sites		-	-
Fox et al [5]	positive	72% of internet users use internet for health info	-	-

Table 2: Type of Analysis

- Regular context codes are something that provide an insight of the scenario of the review where as Universal context codes give a notion of the whole review.

- Regular context codes represent the reviewers opinion about the place in short word. Just for example if the review says, "Love the staff and atmosphere here. The doctor is very professional, yet able to relate to the patient" then the we code it as "positive, professionalism and helpful staff".

- We add new codes if we find any new review that is not covered by an existing code.

- The review is analyzed using Tams after we finish coding selected reviews.

STILL TO FILL IN

Quantitative Analysis

- (Possibly use NLP)

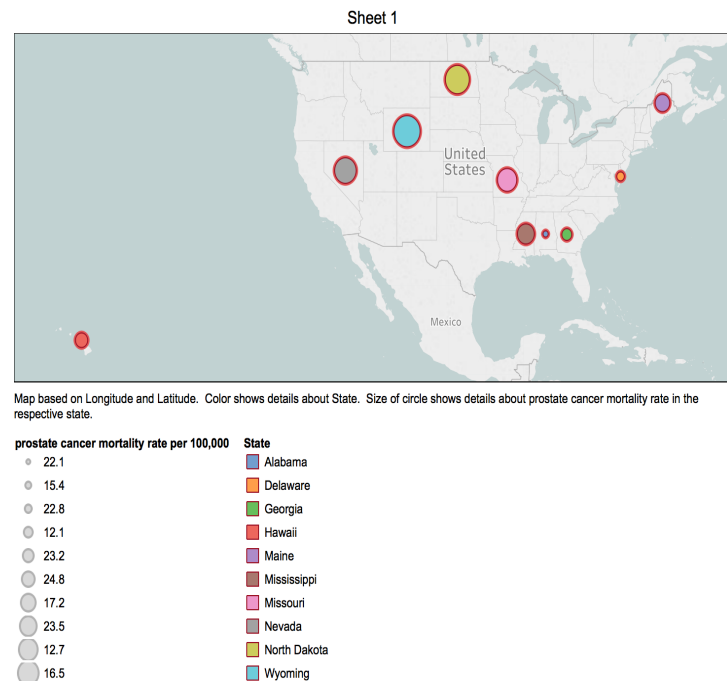- We use Tableau to visualize the quantitative data we collected. [still to fill in]

color

5. LIMITATIONS
- Sampling Issue - worse care associated with income and possibly this demographic is not online

- Sampling Issue - some areas, (if we go with erectile dysfunction), are for higher socioeconomic status groups; some health outcomes may be impacted by socioeconomic status (e.g., people only go to the doctor when they are really sick and, in some cases for cancer, this may be too late for treatment. Having fewer than four pre-birth appointments, among other things hard for low income women, is tied to a higher maternal mortality rate.)

- Among all the reviews of an urologist, very few of them were posted by the patients who had issues related to prostate cancer. Most reviews were posted by the people who have been to an urologist but not necessarily because of prostate cancer. Similarly, many of the reviews for Ob/Gyn's refer to checkups, cancer checks, birth control prescriptions, and other items besides birth.

- www.reviewtrackers.com, a website that monitors reviews from multiple sources and provides the ability to easily respond to reviews, notes that the company can "improve your reviews by 400%, thus positive reviews may not necessarily indicate a positive experience. For example, www.reviewtrackers.com notes HealthGrades, Vitals, and RateMDs are clients.

6. FINDINGS
- We are currently in data collection phase and we will end it as soon as we collect few thousands of them. So far we have collected the data for highest and lowest prostate cancer states within the USA.

- We have selected five states with highest and five states with lowest prostate cancer and maternal mortality rate respectively.

- Hawaii has the lowest prostate cancer mortality rate where as Mississippi has the highest prostate cancer mortality rate in the US.

Sheet 1

Map based on Longitude and Latitude. Color shows details about State. Size of circle shows details about prostate cancer mortality rate in the respective state.

prostate cancer mortality rate per 100,000	State
22.1	Alabama
15.4	Delaware
22.8	Georgia
12.1	Hawaii
23.2	Maine
24.8	Mississippi
17.2	Missouri
23.5	Nevada
12.7	North Dakota
16.5	Wyoming

7. RESULTS AND DISCUSSIONS
7.1 Results
- (YET TO IMPROVE) Using the reviews collected we can analyze health outcomes in each state. Lets take an example of Mississippi, where the prostate cancer mortality rate is highest among all states. What is the relation between the reviews posted by patients and health outcomes in Mississippi ? Let's take Hawaii, which has lowest prostate cancer mortality rate among all US states. What does the review posted by people in Hawaii represent ? Are the people in Hawaii receiving better health care then the people in Mississippi ?

- Using the data collected we will find out the relation between the reviews posted by patients and health outcomes.

- Earlier we were collecting reviews using place names , now we are collecting reviews using longitude and latitude.

website	Real Name	Pseudoname	Location	Age	Past Reviews	Gender	Pictures	Date reviewed
Yelp	*	*	*	-	*	-	*	*
Google	*	-X	X	X	*	-	-	*
Ratemds	X	X	X	X	X	X	X	*
Healthgrades	X	X	*	X	X	X	X	*
Angieslist	X	X	X	X	X	X	X	*
Facebook	*	-	*	-	X			

Table 3: Reviewer Data by API where * indicates most likely available; - indicates may be available; and X indicates not available

website	Doctor Name	Location	Edu History	Star Rating	Review Text	Reviewer Name	Review post Date	Reply to Review	Liking/ Useful	API
Yelp	*	*	X	*	*	*	*	-	*	*
Google	*	*	X	-	-	*	*	-	-	*
Ratemds	*	-	*	*	*	*	*	-	*	X
health grades	*	*	*	*	*	*	*	-	*	X
Angieslist	*	*	X	*	*	X	*	-	X	X
Facebook										*

Table 4: Review Data by API where * indicates most likely available; - indicates may be available; and X indicates not available

paper	no.reviews /reviewers	no.doctors	rural	sub-urban	urban	speciality
Kadry et al[8]	4999 reviews				*	23 specialities
Lopez et al [9]	712 reviews	445			*	
Gao et al [6]		18,174				fam/ped, ob/gy, surgery, hospital, other
Science daily et al [4]	2,813 reviews	275				sports medicine surgeons
Emmert et al. [2]	3052 reviewers.					
Sorrele al. [11]						
Jain et al. [7]						
Gabeuer et al.						
Rosenbaum et al. [10]						cardiologists
Fox et al. [5]						

Table 5: Number of Doctors and Demographics

State	Google	Yelp	State	Google	Yelp
Mississippi	17		Arizona		
Louisiana	16		Wyoming		
Alabama	14		North Dakota		
Georgia	45		Missouri		
South Carolina	41		West Virginia		
Oklahoma	15		Connecticut		
Nevada	43		Alaska		
Idaho	21		Florida		
Nebraska	6		Delaware		
Maine	14		Hawaii		

Table 6: Total number of reviews by website and states[STILL TO FILL IN]

State	PCMR	State	PCMR
Hawaii	12.1	Mississippi	24.8
North Dakota	12.7	Nevada	23.5
Delaware	15.4	Maine	23.2
Wyoming	16.5	Georgia	22.8
Missouri	17.2	Alabama	22.1

Table 7: States with highest and lowest prostate cancer mortality rates where PCMR represents Prostate Cancer Mortality Rate per 100,000 people.

7.2 Discussions

- (YET TO IMPROVE) We are still in the process of data collection. At first we collected few hundred data just using google places API but now we are using latitude/longitude to collect reviews and rating from the google.

- We are running little late in data collection process.

- As soon as we finish data collection we will start coding reviews.

8. REFERENCES

[1] G. API. Google Places API | Google Developers.

[2] M. Emmert, F. Meier, F. Pisch, and U. Sander. Physician choice making and characteristics associated with using physician-rating websites: Cross-sectional study. *Journal of Medical Internet Research*, 15(8), 2013.

[3] C. for disease control and prevention. CDC - Prostate Cancer Rates by State, 2013.

[4] H. for special surgery. Study Finds Little Consistency in Doctor Reviews on Three Physician Ratings Websites, 2017.

[5] S. Fox. The Social Life of Health Information, 2011 | Pew Research Center, 2011.

[6] G. Gao, J. S. McCullough, R. Agarwal, and A. K. Jha. Are doctors created equal? An investigation of online ratings by patients.

[7] S. Jain. Googling Ourselves âĂŤ What Physicians Can Learn from Online Rating Sites. *New England Journal of Medicine*, 362(1):6–7, jan 2010.

[8] B. Kadry, L. F. Chu, B. Kadry, D. Gammas, and A. MacArio. Analysis of 4999 online physician ratings indicates that most patients give physicians a favorable rating. *Journal of Medical Internet Research*, 13(4), 2011.

[9] A. López, A. Detz, N. Ratanawongsa, and U. Sarkar. What patients say about their doctors online: A qualitative content analysis, 2012.

[10] L. Rosenbaum. Scoring No Goal âĂŤ Further Adventures in Transparency. *New England Journal of Medicine*, 373(15):1385–1388, oct 2015.

[11] A. L. Sorrel. Negative online reviews leave doctors with little recourse - amednews.com, 2010.

[12] Yelp Fusion. Documentation - Yelp Fusion.