

Fundamentals of AI for *Public Health*

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“All models are wrong, some are useful.” - George Box

Are You a Data Detective?



Data detectives use PPDAC

Introduction

- It is an undeniable fact that in India there is an extreme shortage of healthcare facilities.
- In light of this it is imperative that in order to meet the growing healthcare needs of the people one would require a significant increase in resources.
- In a resource-constrained economy this is becoming a very challenging task.
- However, what is not commonly understood is whether we are efficiently utilising the existing resources?

The Challenge: DATA

Lack of periodic, credible, and reliable public health data at the level of administrative unit to make *Informed Policy Decisions*

- Sample Registration System (SRS) for IMR, U5MR at state level
 - No district level estimates
 - Is not suited to measures changes from one year to another (have to wait 5 years to analyse if policies are having any desired effect).
- National Family Health Survey (not very frequent) the latest one happened after a gap of 10 years
- HMIS data from the MoHFW is not reliable

Applications of Statistical Models/ML: Economics of Healthcare Delivery using Institutional Data such as AIIMS

- Since 2012, All India Institute of Medical Sciences (AIIMS) has digitised every aspect of out-patient and in-patient journey in the hospital. Digitised
 - Are there patterns in gender discrimination in access to health care with respect to age and distance to health facility? Gender
 - A Data Driven Patient booking System for OPD - Arbitrary Appointment Systems with NO SHOW leads to
 - Long wait time to get an appointment.
 - Sub optimal utilization of resources: Large variance leading to “Under” and “Over” utilization of resources.
 - Paradoxically, on many occasions data reveals, long wait time to get an appointment but a large under utilization of resources.
 - Low patient satisfaction.
 - Machine learning based prediction of antibiotic sensitivity in patients with critical illness ML



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Missing female patients: an observational analysis of sex ratio among outpatients in a referral tertiary care public hospital in India

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Abstract

Objective To investigate gender discrimination in access to healthcare and its relationship with the patient's age and distance from the healthcare facility.**Design and setting** An observational study based on outpatient data from a large referral public hospital in Delhi, India.**Participants** Confirmed clinical appointments.**Primary and secondary outcome measures** Estimates from the logistic regression are used to compute sex ratios (male/female) of patient visits with respect to distance from the hospital and age. Missing female patients for each state—a measure of the extent of gender discrimination—is computed as the difference in the actual number of female patients who came from each state and the number of female patients that should have visited the hospital had male and female patients come in the same proportion as the sex ratio of the overall population from the 2011 census.**Results** Of 2377028 outpatient visits, excluding obstetrics and gynaecology patients, the overall sex ratio was 1.69 male to one female visit. Sex ratios, adjusted for age and hospital department, increased with distance. The ratio was 1.41 for Delhi, where the facility is located; 1.70 for Haryana, an adjoining state; 1.98 for Uttar Pradesh, a state further away; and 2.37 for Bihar, the state furthest from Delhi. The sex ratios had a U-shaped relationship with age: 1.93 for 0–18 years, 2.01 for 19–30 years, and 1.75 for 60 years or over compared with 1.43 and 1.40 for the age groups 31–44 and 45–59 years, respectively. We estimate there were 402 722 missing female outpatient visits from these four states, which is 49% of the total female outpatient visits for these four states.**Conclusion** We found gender discrimination in access to healthcare, which was worse for female patients who were in the younger and older age groups, and for those who lived at increasing distances from the hospital.This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

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<http://dx.doi.org/10.1136/bmjopen-2018-026850>

Statistics from Altmetric.com

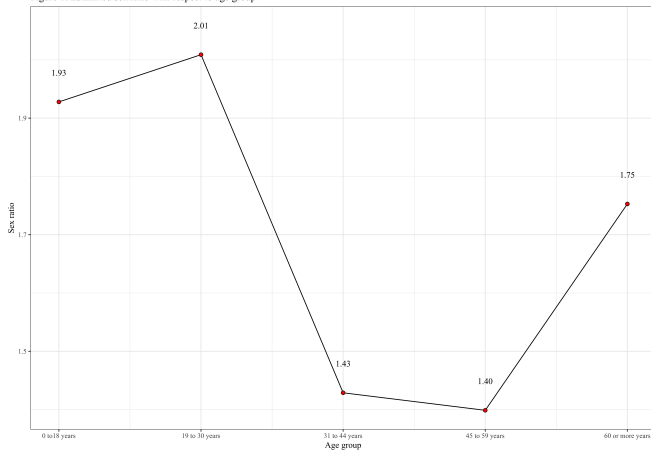


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- On 1 Facebook pages
- 1 reader on Monday



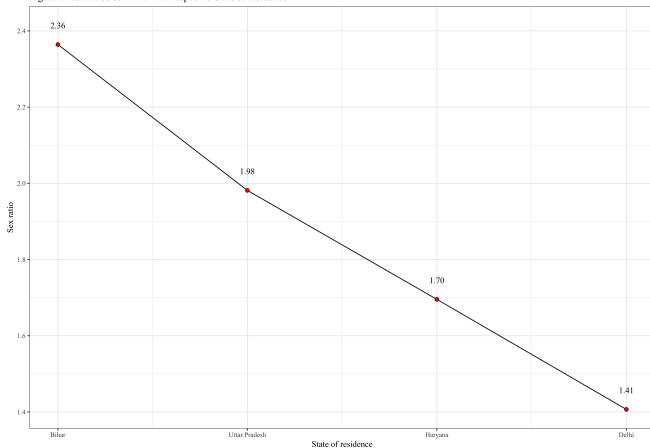
Key findings 1

Figure 1: Estimated sex ratio with respect to age group



Key findings 2

Figure 2: Estimated sex ratio with respect to State of residence

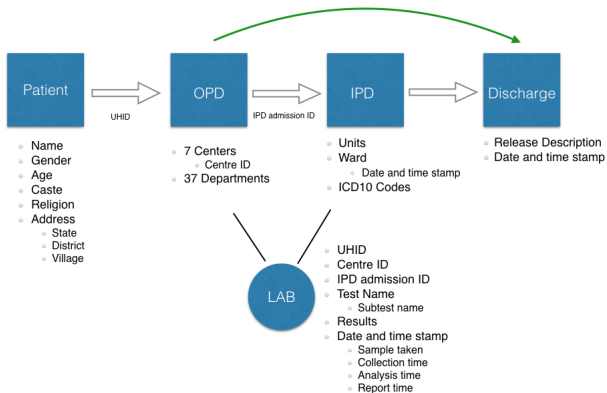


Challenges of Algorithms

- Lack of Robustness
 - Algorithms are based on associations and not on underlying processes.
 - Works well if everything remains the same as past data. But the world is changing!!
- Not accounting for statistical variability
- Implicit bias
- Lack of Transparency

Thank you!

Patient's Journey - Totally Digitised





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Machine learning based prediction of antibiotic sensitivity in patients with critical illness

Posted September 20, 2019.

 Debabrata Ghosh, Shivam Sharma, Eeshan Hasan, Shabina Ashraf, Vaibhav Singh, Dinesh Tewari, Seema Singh, Mudit Kapoor,  Debarka Sengupta

doi: <https://doi.org/10.1101/19007153>

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