

Background:

Social Determinants of Health (SDoH)

Defined as the conditions in which people are born, grow, live, work and age (WHO)

Critical in influencing clinical outcomes

Prove the Value of Verbal Autopsies
in Low and Middle Income
Countries to uncover and tackle
various Social Determinants of
Health related issues

Background: Verbal Autopsy Dataset



Valuable tool where vital registration systems do not exist.

Both parties were blinded to the official cause of death.

12,500 gold standard verbal autopsies across six sites in India, Mexico, the Philippines and Tanzania



Example of a free-text response

the deceased was **working in a shop** in [PLACE]. sometimes they **finished their work at 2 o'clock in the morning** and when he comes home he will **just eat bread and drink water and it also serve as his breakfast**. it was 2nd week of october 2007, his son went home to [PLACE2] because he felt an epigastric pain. the next day they consulted him at municipal health center. she let her son take kremil-s and mefenamic tablet to relieve the pain. her son felt better, so he goes back to his work in [PLACE]. [DATE] her son went home again to vote for the barangay election but he claim again that he had headache, and he again experienced epigastric pain and because it was so painful he cannot have the proper position. he started to have fever without sweating. he always vomit and his body start to become edematous. they were **not able to bring him immediately to a doctor due to financial constrain**. as time past, the situation of the patient got worst, that made them decide to bring on to **admit the patient to a hospital even if they don't have enough money**. the try to admit him first at [HOSPITAL] but when they were there, the hospital was full, so they decided to admit him at [HOSPITAL2]. they stayed there for 1 week. the patient's edema on his face got worst. he always had a high bp (200/80) then his chest and nape get bigger. the doctor told them that her son had an enlargement of the heart. the patient oftentimes defficated with waste like blood. **because the had spend a lot of money in the private hospital, they decided to transfer the patient in [HOSPITAL3]**. within two days of admission in the provincial hospital, the eyesight of the patient was affected. his novel swell hours before the patient died the doctor inform and ask their consent for the patient to undergo an operation. the patient humbly ask his mother to have him operated because he still wants to be alive. the side of the patient's body had a whole. the patient also ask her mother to embrace him while saying he felt pity for his mother because he will leave her. after a few minutes, the patient died, and the operation was not done. the mother of the deceased related, that as they know her son's intestine was not normally functioning and his kidney illness got worst. the also believe that one cause of his death was he had the **pasmo sa kusog**.

Cause of Death

gs_text34_x	GS_causeofdeath	
	Cirrhosis	1
	Epilepsy	2
	Pneumonia	3
	COPD	4
	Acute Myocardial Infarction	5
	Fires	6
	Renal Failure	7
	AIDS	8
	Lung Cancer	9
	Maternal	10
	Drowning	11
	Other Cardiovascular Disease	12
	Other Non-communicable Diseases	13
	Falls	14
	Road Traffic	15
	Bite of Venomous Animal	16
	Diabetes	17
	TB	19
	Suicide	20
	Other Injuries	21
	Cervical Cancer	22
	Stroke	23
	Malaria	24
	Asthma	25
	Colorectal Cancer	26
	Homicide	27
	Diarrhea/Dysentery	28
	Breast Cancer	29
	Leukemia/Lymphomas	30
	Poisonings	31
	Prostate Cancer	32
	Esophageal Cancer	33
	Stomach Cancer	34

Reduce the number of classes for easier training

Cancers		
Lung Cancer	9	1
Cervical Cancer	22	
Colorectal Cancer	26	
Breast Cancer	29	
Leukemia/Lymphomas	30	
Prostate Cancer	32	
Esophageal Cancer	33	
Stomach Cancer	34	

Heart related		
COPD	4	4
Acute Myocardial Infarction	5	
Other Cardiovascular Diseases	12	
Diabetes	17	
Asthma	25	

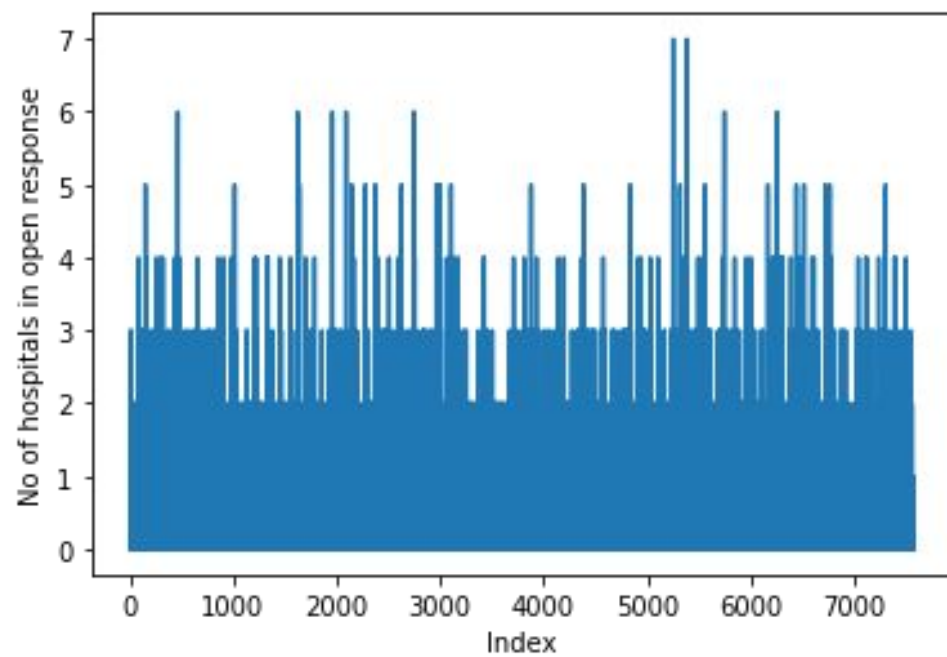
Diseases		
Pneumonia	3	3
AIDS	8	
Maternal	10	
TB	19	
Malaria	24	
Diarrhea/Dysentery	28	

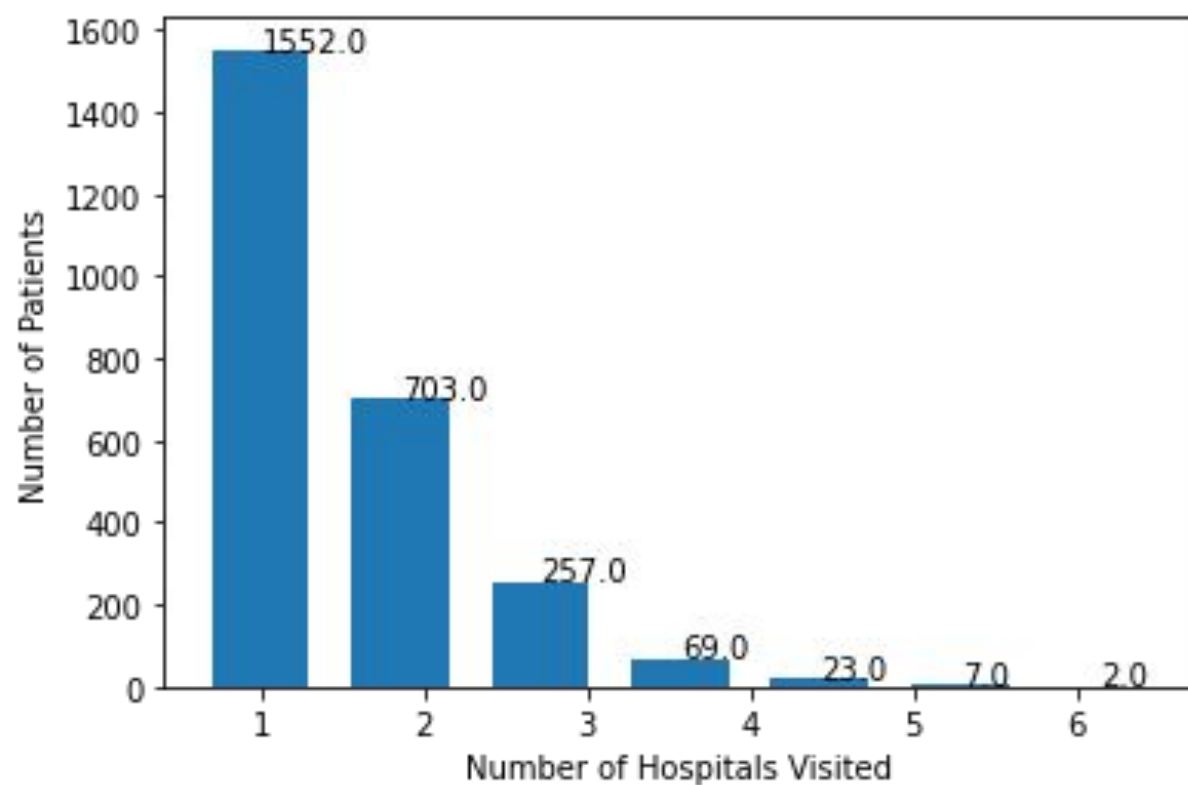
Accidents		
Fires	6	2
Drowning	11	
Falls	14	
Road Traffic	15	
Bite of Venomous Animal	16	
Poisonings	31	

Reduce the number of classes
for easier training

Brain		
Epilepsy	2	5
Stroke	23	
Liver		
Cirrhosis	1	6
Renal Failure	7	

Others reasons		
Other Non-communicable Diseases	13	7
Other Infectious Diseases	18	
Other Injuries	21	
Suicide		
Suicide	20	8
Homicide		
Homicide	27	9





Correlations

Separate Kitchen		Number of Hospitals	
Yes	0	Visited 1 Hospitals	1
No	1	Visited 2 Hospitals	2
		Visited 3 Hospitals	3
		Visited 4 Hospitals	4
		Visited 5 Hospitals	5
		Visited 6 Hospitals	6
Correlation	0.7		

```
✓ [21] corr_val = data['nhospitals'].corr(data['g4_08'])  
0s      print(corr_val)
```

```
0.690069328358475
```

Correlations

Education Level		Number of Hospitals	
No Schooling	1	Visited 1 Hospitals	1
Primary School	2	Visited 2 Hospitals	2
High School	3	Visited 3 Hospitals	3
College or Higher	4	Visited 4 Hospitals	4
		Visited 5 Hospitals	5
		Visited 6 Hospitals	6
Correlation	-0.3		

```
✓ [17] #correlation between number of hospitals visited per case and level of education of patient  
0s corr_val = data['nhospitals'].corr(data['g5_06a'])  
    print(corr_val)
```

```
-0.29271987715055175
```

RandomForest Classifier Results

Model 1

Education and Separate Kitchen with
Cause of Death as the ground truth label

Accuracy: **0.7611408199643493**

RandomForest Classifier Results

Model 2

Education, Separate Kitchen, and Number of Hospitals (open response) with
Cause of Death as the ground truth label

Accuracy: **0.7602495543672014**

RandomForest Classifier Results

Model 4

Death Certificate Issued (Yes/ No) with
Cause of Death as the ground truth label

Accuracy: **0.6997**

RandomForest Classifier Results

Model 5

Death Certificate Issued (Yes/ No) and feature from open response (number of hospitals) with Cause of Death as the ground truth label

Accuracy: **0.7193**

RandomForest Classifier Results

Model 7

Death Certificate Seen by interviewer (Yes/ No) with
Cause of Death as the ground truth label

Accuracy: **0.6893**

RandomForest Classifier Results

Model 8

Death Certificate Seen by interviewer (Yes/ No) and feature from Open Response (Number of Hospitals) with Cause of Death as the ground truth label

Accuracy: **0.6965**