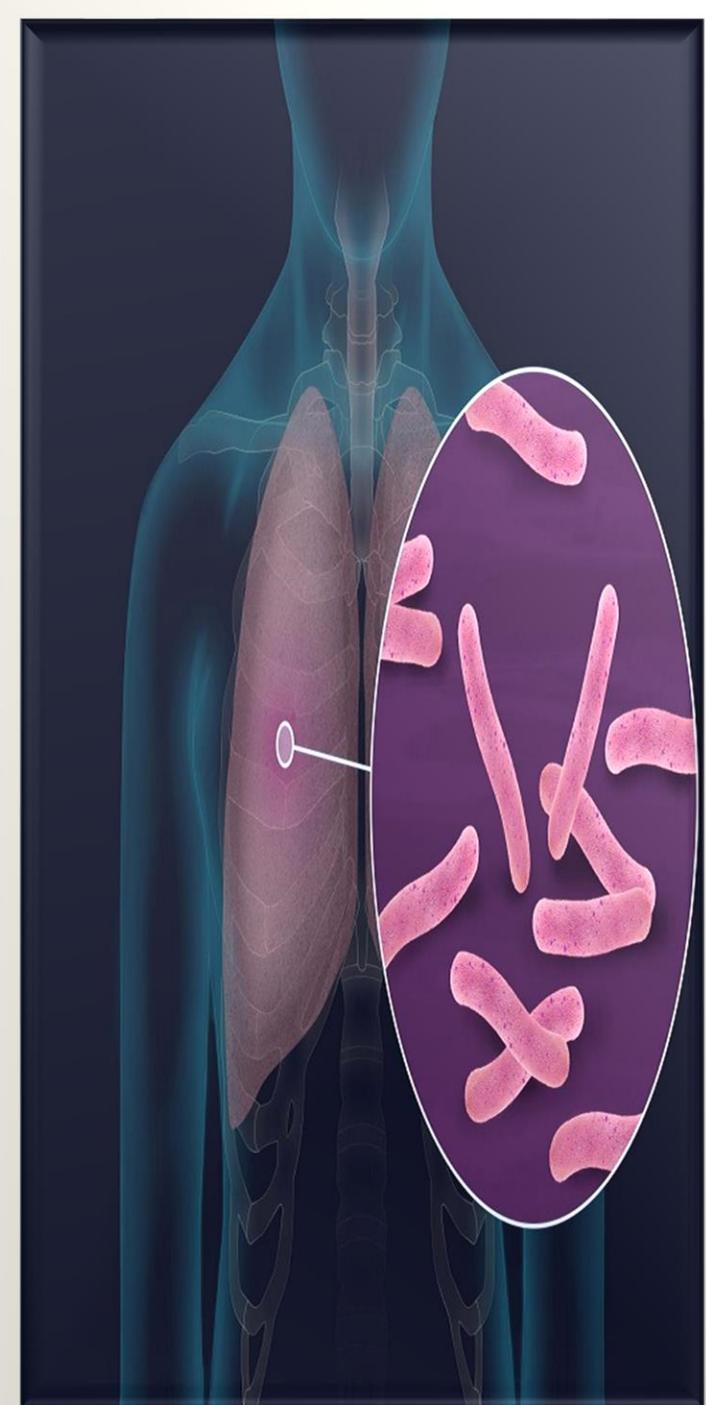# Therapy duration and long-term outcomes in extra-pulmonary tuberculosis

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Course: Biostatistics-II

Outline:

Objective of the Study

The main objective of the study was to investigate the therapy duration and long-term outcome in extrapulmonary tuberculosis using machine learning model.

Unpredictable illnesses

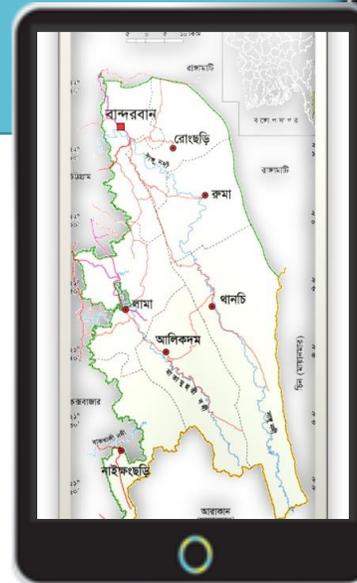**Socioeconomic correlation**

Determinants of poverty

Healthcare Services

Treatment seeking

Extremely poor Adivasi

Study Site, Population

Study Site and Period

- State of Texas, USA
- Between January 2020 to December 2005

Inclusion & Exclusion

Excluded persons ≤18 years-old

Statistical model

A machine learning technology (CART)

Sampling Technique & Size

- A retrospective cohort
- Sample size: 9,441

Project intervention

This study was funded by National Institutes of Health (NIH) Grant R01AI079497 and NIH New Innovator Award DP2 OD001886-01

Database and collection

- Secondary data and collect from patient registry
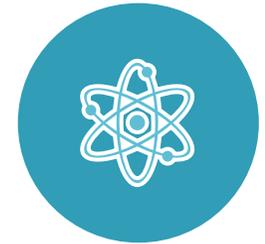- Integrated with SSA death master file

Statistical analysis

- Regression tree
- Cox proportional
- Pearson's Chi-Squared
- Kruskal-Wallis tests

		Major site of tuberculosis disease			
B (%)	Lymph nodes n=163 (%)	Bone and joint n=92 (%)	GUS n=24 (%)	Meninges n=55 (%)	Peri n=4
18)	47(18)	52(19)	48(17)	43(15)	49
51)	76(47)	46(50)	15(63)	31(56)	23
49)	73(45)	46(50)	20(83)	24(44)	21
49)	85(52)	45(49)	3(13)	31(56)	22
2)	5(3)	1(1)	1(4)	0	
28)	42(26)	25(27)	11(46)	14(25)	11
72)	121(74)	67(73)	13(54)	41(75)	35
07)	14(9)	5(5)	1(4)	2(4)	
4)	8(5)	2(2)	1(4)	3(5)	
3)	3(2)	1(1)	1(4)	4(7)	
11)	17(10)	8(9)	2(8)	3(5)	11
3)	4(2)	6(7)	0	1(2)	
08)	18(11)	5(5)	2(8)	2(4)	5
21)	52(32)	5(5)	1(4)	16(29)	6
3)	3(2)	4(4)	3(13)	1(2)	
17)	37 (23)	11 (12)	6(25)	4(7)	6
70)	131(80)	72(78)	16(67)	22(40)	30

Results

- There were 9,441 patients diagnosed with tuberculosis in Texas during the entire study period. Of these 837 (16%) had EPTB, and 438 (52%) fulfilled study criteria.

- Table shows that patients' median age significantly differed across the type of EPTB (p = 0.02).
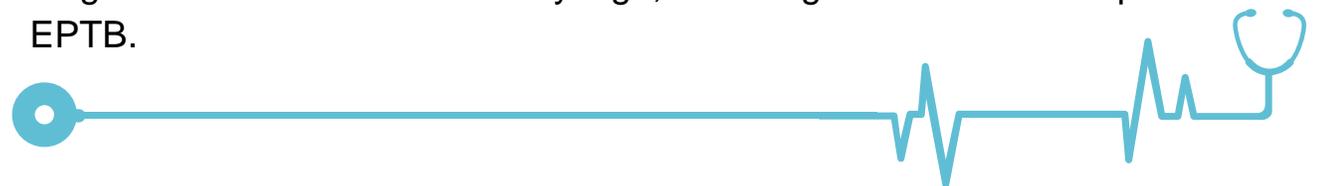
- PTB syndrome (i.e., anatomic site of tuberculosis) significantly differed by self-identified "race": 83% of genitourinary system-tuberculosis patients were "white" while 17% were distributed among the remainder.

- The median therapy duration was 8 (interquartile range: 6-11) months. One hundred twenty-four (28%) patients died during the observation period.

- Analysis showed that the 346 patients with documented evidence of having completed treatment. Since life expectancy is higher in women than men, and longterm survival is affected by age, the long-term survival in patients with EPTB.

Results...

01 — ART analyses identified age-at-diagnosis (age), therapy duration, EPTB syndrome (i.e., anatomic site of disease), and HIV-status as significant predictors of survival.

02 — Therapy duration versus survival was described by a "V" shaped response by sing CART response.

03 — The relationship between treatment duration and mortality was examined in greater detail for each EPTB syndrome, since treatment duration is potentially modifiable.

04 — When tuberculous meningitis, which had the sharpest early decline in survival after completion of therapy, was examined as the referent, the mortality also differed from some of the non-genitourinary tuberculosis patients.

05 — Therapy duration increased towards the nadir, survival improved to a maximum at the vertex, after which longer therapy was associated with worse survival.

06 — The therapy duration associated with lowest mortality was 7 months for peritoneal tuberculosis, 8 months for meningitis, 9 months for lymphadenitis, and 10 months for all "other"-tuberculosis syndromes.
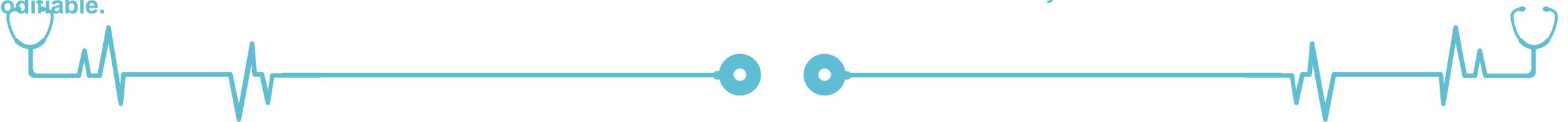
Conclusion

Different EPTB syndromes have different long-term outcomes and different therapy durations associated with lowest mortality. The long-term outcomes for such syndromes as peritoneal and meningeal tuberculosis adequately treated with modern chemotherapy are sufficiently poor as to be indistinguishable from some types of tuberculosis before the advent of chemotherapy. The different syndromes should not be lumped into single wastebasket diagnosis of EPTB.

Limitations and Recommendations

Retrospective nature of design is one of the major limitations as well as missing observation from the secondary source of data.

The study patients' age distribution was skewed in favor of an elderly population with naturally higher co-morbid conditions and consequently poorer long-term survival.

The CART analysis is another drawback for this type of analysis, but it is widely used for clinical decision making. The CART analysis is another drawback for this type of analysis, but it is widely used for clinical decision making.

RECOMMENDED