# The Double Edged Sword: Diabetes Mellitus and Tuberculosis in Georgia, USA

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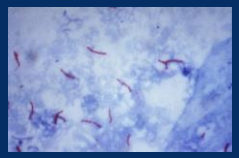
# TB and DM in Georgia, USA

Background:

- Diabetes Mellitus (DM) conveys 3 times risk of TB disease
- DM is associated with increased risk of TB death and treatment failure

Objectives: Compare clinical characteristics and treatment outcomes between diabetic and non-diabetic adults with active TB reported to a state TB program in Georgia

- Among all Verified TB Cases
  - Risk Factors for Mortality
- Among Culture + Pulmonary TB cases
  - Risk for sputum smear positivity and cavitary disease at presentation
  - Differences in time to culture conversion



# Mortality Cohort
## N= 1130

| Characteristic | Non DM n=990 (%) | DM n=140 (%) | P-value (2 tail) |
|---|---|---|---|
| **Mean Age** | 44.1 | 57.4 | **<. 0001** |
| Male | 649 (66) | 100 (71) | NS |
| Black vs. Other | 501 (51) | 70 (50) | NS |
| **HIV** | 131 (13) | 7 (5) | **0.005** |
| **ESRD** | 21 (2) | 9 (6) | **0.003** |
| Pulmonary TB | 787 (80) | 118 (84) | NS |
| Pulm + Extra Pulmonary | 54 (6) | 6 (4) | NS |
| Culture Positive | 867 (74) | 125 (79) | NS |
| Overall Mortality | 118 (12) | 24 (17) | NS |
| Death at Diagnosis | 27 (3) | 3 (2) | NS |
| **Death During Therapy** | **91 (9)** | **21 (15)** | **0.03** |

# Predictors of Mortality Among all Verified Cases: Multivariate Analysis (N=1130)

| Characteristic | aOR (95% CI) |
|---|---|
| Diabetes | 0.92 (0.54-1.55) |
| Foreign Born | 0.66 (0.42-1.04) |
| **HIV** | **1.93 (1.13-3.30)** |
| **ESRD** | **3.65 (1.59-8.40)** |
| **Culture positive** | **2.18 (1.22-3.88)** |
| **CNS** | **5.97 (2.40-14.83)** |
| **Miliary Disease** | **2.76 (1.36-5.63)** |
| Diagnosed in Jail | **0.23 (0.05-0.96)** |

*OR not significant for homelessness, excess EtOH use or drug resistance

(Adjusting for age, sex, race)

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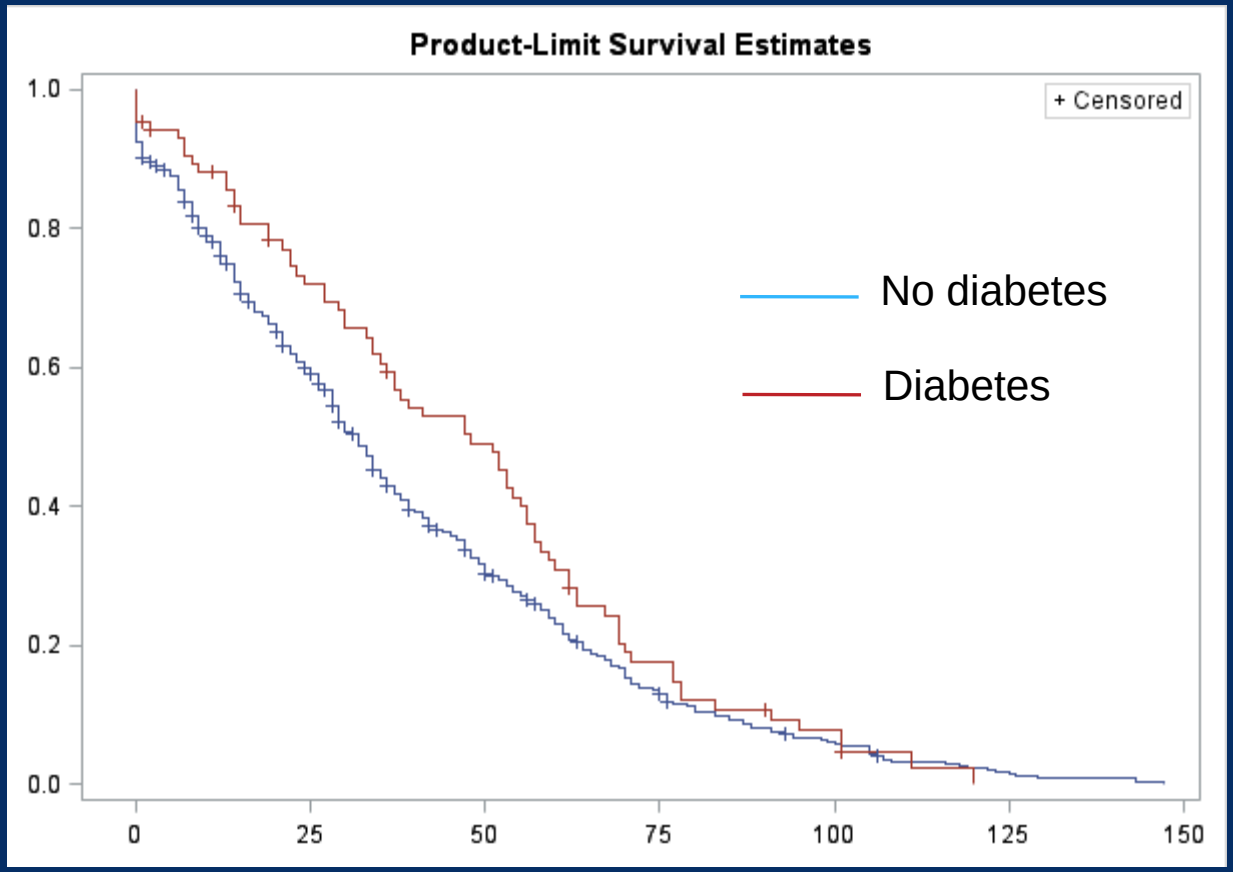
# Culture Positive Pulmonary TB Cases N= 756 (57%)

| Characteristic | No DM (%) N=665 (57) | DM (%) N=91 (58) | P-value (2 tail) |
|---|---|---|---|
| Mean Age | 45 | 45 | NS |
| Male | 462 (69) | 65 (71) | NS |
| Foreign Born | 294 (44) | 41 (45) | NS |
| **HIV Positive** | 89 (14) | 2 (2) | **0.002** |
| **Sputum Smear Positive** | 428 (65) | 69 (77) | **0.03** |
| **Cavitary Lesion (XR/CT)** | 299 (46) | 61 (69) | **<0.001** |
| Culture Conversion Documented | 591 (89) | 77 (85) | NS |
| Culture conversion at 2 mo | 478 (80) | 58 (75) | NS |
| Overall Mortality | 64 (10) | 11 (12) | NS |

# Product limit survival estimates: Days to TB sputum culture negative among pulmonary TB patients with and without diabetes mellitus




| | Total | Converted, N (%) | Censored, N (%) | P-value |
|---|---|---|---|---|
| No diabetes | 661 | 587 (88.8) | 74 (11.2) | Log rank = 0.07 |
| Diabetes | 90 | 76 (84.4) | 14 (15.6) | **Wilcoxon = 0.01** |

# Discussion

## Conclusions

- *No difference in overall mortality, but DM may increase risk for death during therapy*
- Diabetics with increased rate of cavitary disease
  - *Presenting with more advanced disease*
- Higher smear positivity and longer time to sputum culture conversion among diabetics
  - *Increased infectious risk*

## Limitations

- DM status passively reported
  - Glucose, Hgb A1C not included in database
- Inconsistencies in timing of sputum collection

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# Thank You

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# Additional Slides

# Cases Identified 1/2009-10/2012

| Cohort | N (%) |
|---|---|
| All Verified TB Cases | 1329 |
| Mortality Analysis:<br>- All with known outcome of death<br>- All with at least 6-months follow-up | 1130 (85) |
| Culture positive Pulmonary TB | 756 (57) |

# Methods

- Inclusion
  - Verified TB cases reported to GA Department of Public Health over a 45 month period (Jan 2009-Oct 2012)
  - Age ≥16 yrs
- Data Source: State Electronic Notifiable Disease Surveillance System (SENDSS)
- Analysis:
  - Associations between DM and TB: chi-square, t-tests, and multivariable logistic regression
  - Time to sputum culture conversion: Kaplan-Meier

# Predictors of Mortality Among all Verified Cases: Univariate Analysis (N=1130)

| Characteristic | OR (95% CI) |
|---|---|
| Age, per year | **1.04 (1.03-1.05)** |
| Male | **1.88 (1.24-2.84)** |
| Diabetes | 1.53 (0.95-2.47) |
| Black Race | **1.54 (1.08-2.20)** |
| HIV | **1.86 (1.17-2.95)** |
| ESRD | **4.28 (1.99-9.20)** |
| Culture Positive | **2.05 (1.21-3.47)** |
| **Disease Location** | |
| CNS | **3.12 (1.40-6.95)** |
| Miliary Disease | **2.74 (1.44-5.19)** |
| Foreign Born | **0.38 (0.25-0.57)** |
| Diagnosed in Jail | **0.18 (0.04-0.74)** |

*OR not significant for homelessness, excess EtOH, drug use or INH +/- RIF resistance

# Next Steps

- Raising awareness
- Incorporating DM screening into state TB guidelines
- Improving reporting on DM status
- Pilot study screening for LTBI in diabetic population
- Investigate benefits of targeted LTBI treatment and enhanced glucose control in diabetic TB populations


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