ALCOHOL DIAGNOSTIC VALIDATION FOR INJURY-RELATED TRAUMA (AVIRT):

FINDINGS FROM AN EMERGENCY ROOM SETTING IN CAPE TOWN

Megan Prinsloo, Petal Petersen Williams, Shibe Mhlongo, Ian Neethling, Asiphe Ketelo, Desiree Pass, Jodilee Erasmus, Sithombo Maqungo, Margaret Peden, Charles Parry and Richard Matzopoulos

Burden of Disease Research Unit
South African Medical Research Council

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BACKGROUND

- Alcohol consumption is a key driver of the burden of violence and injury in South Africa (SA)

- Routine testing and capturing for alcohol consumption, following non-fatal injuries are lacking in SA

- Globally, reasons for this include:

  - the difficulty in assessing blood alcohol concentration (BAC) because of the time-lapse after the incident (Flynn & Wells, 2013; WHO, 2007)

  - the lack of appropriate alcohol diagnostic tools in the emergency settings to accurately screen patients for their use of alcohol (WHO, 2007)

AIM

- To validate alcohol diagnostic tools for injury-related trauma, to measure the burden of alcohol on the health system (as a tool for policy advocacy) and to enable monitoring the impact of alcohol policy reforms more broadly

METHODS

ALCOHOL DIAGNOSTIC SCREENING TOOL MEASURES

1) Blood sample: Detecting the presence or absence of ethanol in the blood. **Enzyme Immunoassay used** and not gas chromatography, **as the gold standard** (Jones, 2019)

2) Clinical assessment: Measures severity of impairment of **speech, motor coordination, attention, behavioural disturbances**, etc. through use of a Likert scale using ICD-10, Y91 codes (Not intoxicated to very severe intoxication) WHO, 2019

3) Active breathalyzer testing: The alcohol concentration measured in Breath Alcohol (BrAC) mg/l in exhaled breath through a mouthpiece. **Dräger: SANAS accredited breathalyzer.**

4) Passive breathalyzer testing: Exhaled breath for especially ventilated patients to indicate the presence or absence of breath alcohol as a **positive or negative reading**

STUDY CRITERIA

- *Inclusion criteria:*

- Adults 18 years and older, who presented with injury-related trauma for 1st time treatment

- Injuries that have occurred <8 hours prior to arrival at the emergency trauma unit

- *Exclusion criteria:*

- Adults who were cognitively impaired, regardless of 1st time treatment of injury

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SAMPLING , DATA COLLECTION & ANALYSIS

- *Study setting and Sampling:*

- Mitchell's Plain District Hospital, Cape Town, SA

- 600 minimum required by BAC categories: none, mild, moderate, severe, very severe

- *Data collection:*

- 847 patients seen over weekend night duty, with 595 eligible (70%)

- **469 enrolled/consented** (**79%**); 126 not enrolled (42 delayed consents)

- **62%** of 447 patients were <u>above legal BAC limit for driving</u> of <0.05g/100ml

- *Data analysis:*

- Lineal weighted Kappa (level of agreement), sensitivity, specificity

- Robust linear regression, using inverse calibration

RESULTS

CLINICAL VS BLOOD ALCOHOL CONCENTRATION (BAC)

Y91 code	None: 0-0.049g/100ml	Mild: 0.050-0.099 g/100ml	Moderate: 0.100-0.199 g/100ml	Severe: 0.200-0.299 g/100ml	Very severe: 0.300+ g/100ml	Total
Not intoxicated	163	0	4	3	0	170
Y91.0 Mild	12	23	51	28	7	121
Y91.1 Moderate	1	3	27	50	6	87
Y91.2 Severe	0	0	12	26	11	49
Y91.3 Very Severe	0	2	2	9	7	20
Total	176	28	96	116	31	447

- **Lineal weighted Kappa** = 0.597 -Moderate agreement (Cohen, 1968) between clinical coding and BAC

BAC VS PASSIVE BREATHALYZER

| Passive	BAC		Total
	No alcohol: <0.05g/100ml	Positive: 0.05+	
Not intoxicated	150	8	158
Positive: 0.03g/100ml	28	261	289
Total	178	269	447

- **Lineal weighted Kappa:** 0.83 -Near perfect agreement (Cohen, 1968) between BAC and Passive breathalyzer
- **Sensitivity**: 97.03 (% positive outcome)
- **Specificity**: 84.27 (% negative outcome)

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PASSIVE VS ACTIVE BREATHALYZER

| Passive	Active		
	None	**Positive: 0.05g/100ml +**	**Total**
Not intoxicated	139	7	146
Positive: 0.03g/100ml+	26	203	229
Total	165	210	375

- **Lineal weighted Kappa:** 0.82 -Near perfect agreement (Cohen, 1968) between passive and active breathalyzer
- **Sensitivity**: 96.67 (% positive outcome)
- **Specificity**: 84.24 (% negative outcome)

BAC VS ACTIVE BREATHALYZER –LINEAR REGRESSION
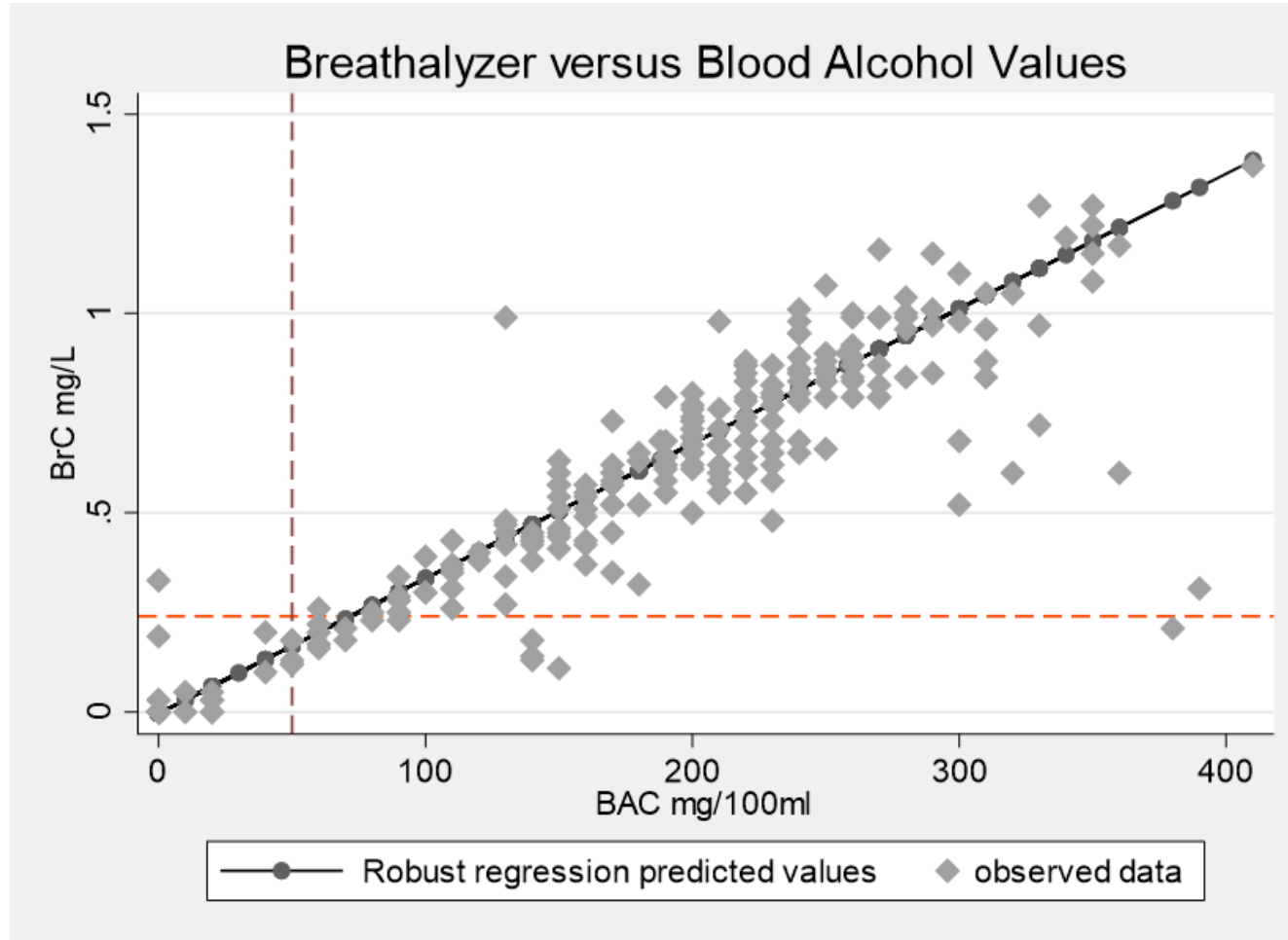
- The two legal limits for **breath** (0.24mg/L) and **blood alcohol** (50mg/100ml) intersect above the regression line
- Active breathalyzer thus underestimates BAC at the legal limit
- Large sample over breath and blood alcohol values allows for a good calibration analysis
- Regression line fits non-outlying data well
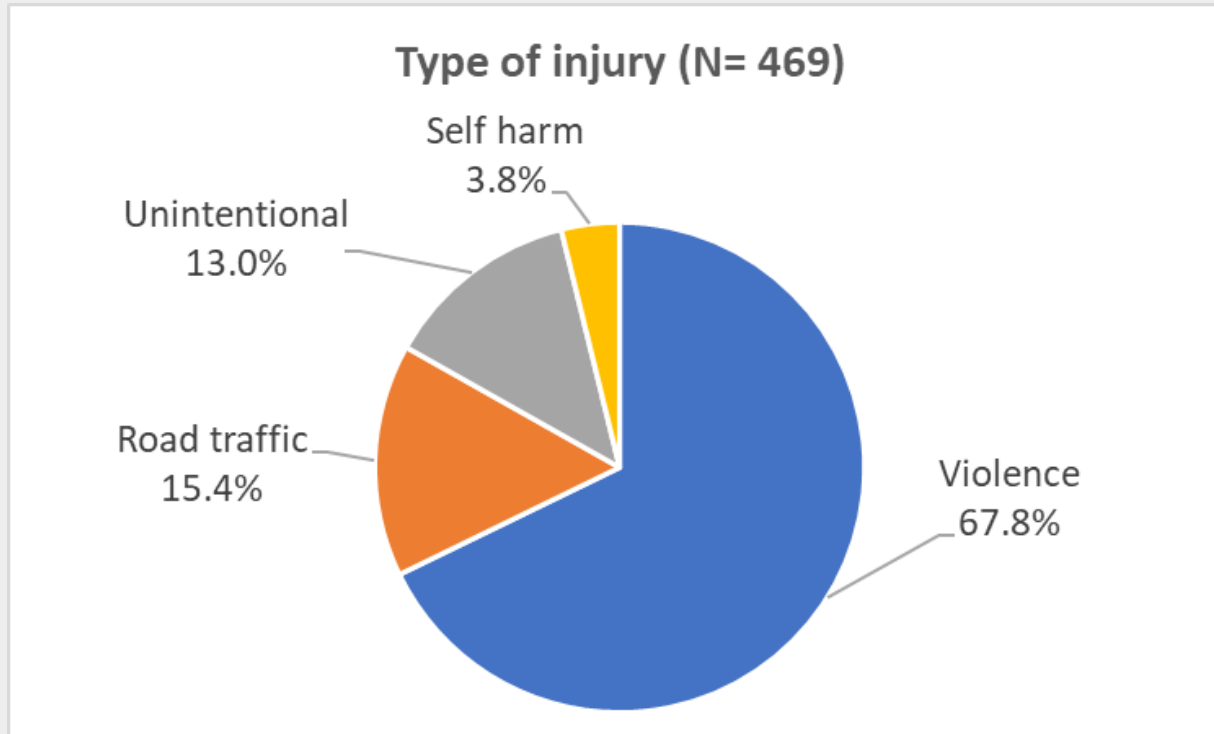- Outliers were investigated

BAC VS ACTIVE BREATHALYZER –LINEAR REGRESSION, INVERSE CALIBRATION
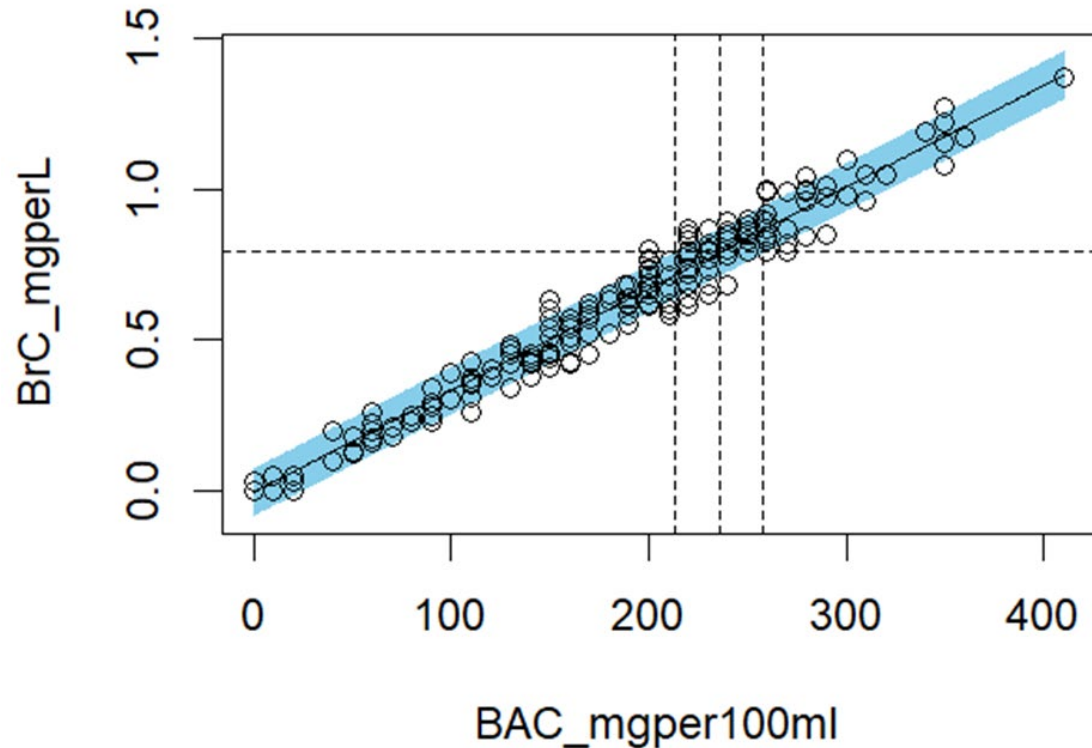
- Fitted Breathalyzer on BAC using a robust regression model due to many outliers
- Weights were given to outliers to fit the regression through the majority of points
- Outlying values were assigned smaller weights and extreme outliers were ignored by assigning a zero weight
- Co-efficient = 0.003 (p<0.001) for every mg/100ml change of BAC

- Dräger breath alcohol legal limit: 0.24mg/L = 0.05 g/dl blood alcohol or 50mg/100ml

INJURY EPI

Type of injury (N= 469)

- Violence 67.8%
- Road traffic 15.4%
- Unintentional 13.0%
- Self harm 3.8%

- Males: 74.4%; Females 25.6%
- Mean age: 32 years
- <u>Leading injury mechanisms</u>:
  - Stab/cut: 44.6%
  - Blunt object: 15.6%
  - Pedestrian: 6.8%
  - Passenger: 6.2%
  - Gunshot: 6.2%

CONCLUSION

- BAC vs Active breathalyzer: Linear regression shows significant correlation, and linear trend up to 0.25g/100ml

- Near perfect agreement: BAC vs Passive & Passive vs Active breathalyzer

- Moderate agreement: ICD coding vs BAC; possible drug interference

- Alcohol diagnostics are useful to advocate for alcohol policy reform and to serve as a barometer for monitoring the impact thereof

- Results indicate that resource poor settings can reliably implement passive breathalyzer testing at a minimum, while BAC testing remains the optimal requirement

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Acknowledging the SAMRC's historical role and silence during apartheid,

we commit our capacities and resources to the continued promotion of justice and

dignity in health research in South Africa.

Thank you!
megan.prinsloo@mrc.ac.za