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

FINDINGS FROM MITCHELL'S PLAIN DISTRICT HOSPITAL'S EMERGENCY ROOM, CAPE TOWN

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BACKGROUND

- Alcohol consumption is a key driver of the burden of injury in South Africa (SA)
- Routine testing for alcohol consumption are lacking in SA emergency rooms (ERs)
- Globally, reasons for this include:
  - the **time-lapse** in assessing blood alcohol concentration (BAC) after the incident (Flynn & Wells, 2013; WHO, 2007)
  - the lack of appropriate alcohol diagnostic tools in ER settings (WHO, 2007)

AIM

- To validate alcohol diagnostic tools for injury-related trauma, to enable monitoring of the impact of alcohol policy reforms more broadly

ALCOHOL DIAGNOSTIC SCREENING TOOL MEASURES

1) Venous blood sample: Enzyme Immunoassay used to test for ethanol and not gas chromatography, as the referenced 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** (WHO, 2019)

3) Active breathalyzer/evidential breath alcohol testing: Digital measurement of **Breath Alcohol** (BrAC) mg/l in exhaled breath through a mouthpiece of a **Dräger breathalyzer.**

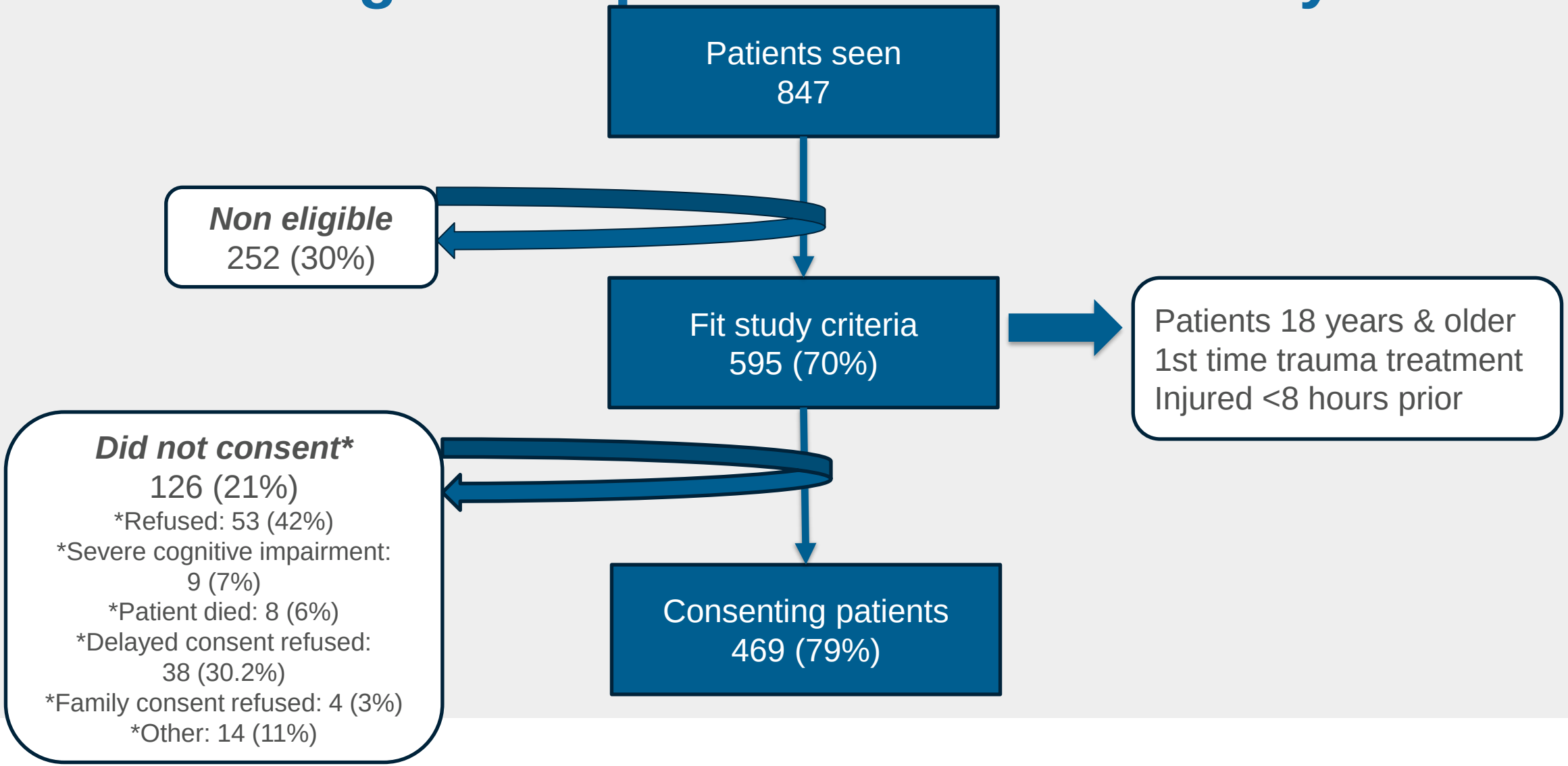
4) Passive breathalyzer testing: Exhaled breath to indicate the presence or absence of breath alcohol as a **positive or negative reading.**

SAMPLING , DATA COLLECTION & ANALYSIS

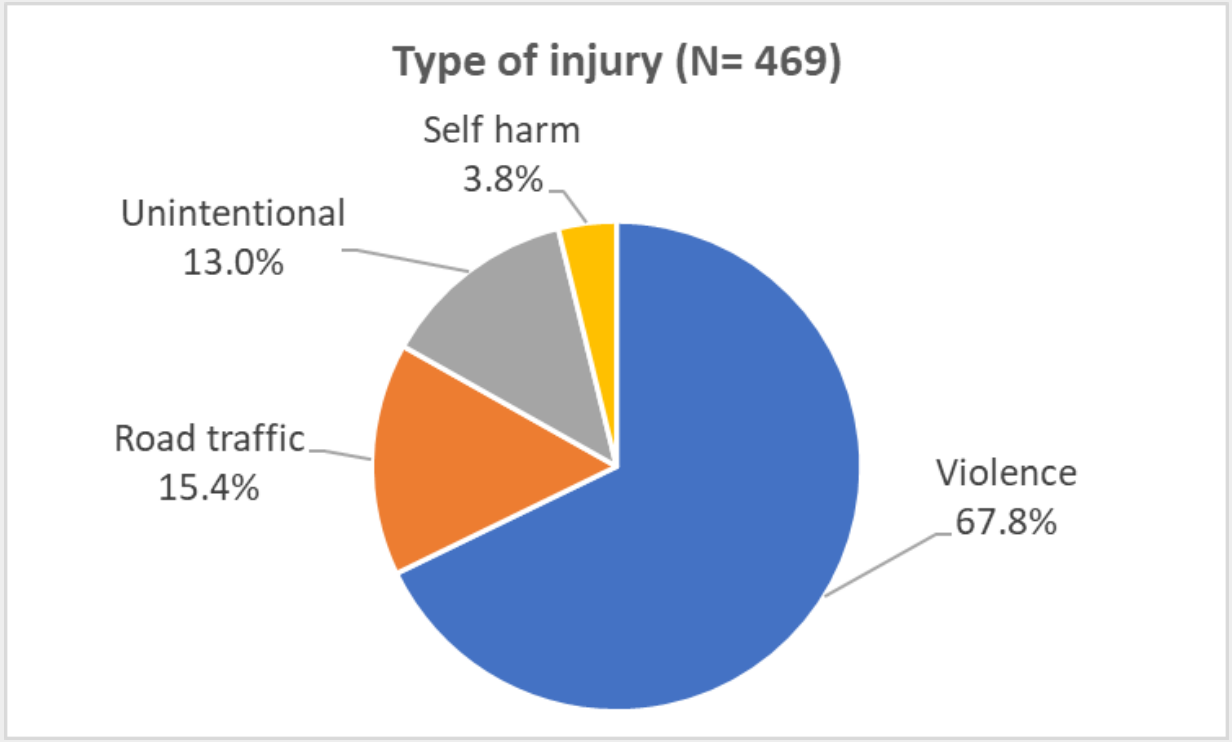
- *Study design, setting and Sampling:*
- Cross-sectional study at Mitchell's Plain District Hospital (30km from Cape Town CBD)
- 396 patients required at 90% power ($p<0.05$) by BAC category

- *Data collection:*
- Occurred over weekend night duty (7pm to 7am) over a 3-month period
- Alcohol diagnostic results, type of injury, mechanism, age, sex, time of injury, time of blood sample
- Blood samples were sent to a Pathcare lab for centrifugation in <2hours
- Serum sample sent to a 2nd Pathcare lab for BAC testing

Flow diagram of patients in AVIRT study



INJURY PROFILE OF CONSENTING PATIENTS



- Males: 74%; Females 26%
- Mean age: 37 years
- Leading injury mechanisms (80%):
  - Stab/cut: 45%
  - Blunt object: 16%
  - Pedestrian: 7%
  - Passenger: 6%
  - Gunshot: 6%
- 60% were above the legal driving blood alcohol limit of <0.05g/100ml
- 37% tested zero for BAC

CLINICAL VS BLOOD ALCOHOL CONCENTRATION (BAC)

Y91 code	None: 0g/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	158	0	4	3	0	165
Y91.0 Mild	6	23	51	28	7	115
Y91.1 Moderate	0	3	27	50	6	86
Y91.2 Severe	0	0	12	26	11	49
Y91.3 Very Severe	0	2	2	9	7	20
Total	164	28	96	116	31	435

- **Lineal weighted Kappa** = 0.60 -Moderate agreement (Cohen, 1968) between clinical coding and BAC

BAC VS PASSIVE BREATHALYZER

Passive	BAC		
	No alcohol: 0g/100ml	Positive: >=0.05g/100ml	Total
Not intoxicated	143	8	151
Positive: 0.03g/100ml	22	261	283
Total	165	269	434

- **Lineal weighted Kappa:** 0.85 -Near perfect agreement (Cohen, 1968) between BAC and Passive breathalyzer
- **Sensitivity**: 97.03 (% positive outcome)
- **Specificity**: 86.67 (% negative outcome)

PASSIVE VS ACTIVE BREATHALYZER

Passive	Active		
	None	Positive: >=0.05g/100ml	Total
Not intoxicated	136	9	145
Positive: 0.03g/100ml+	16	210	226
Total	152	219	371

- **Lineal weighted Kappa:** 0.86 -Near perfect agreement (Cohen, 1968) between passive and active breathalyzer/evidential breath alcohol testing
- **Sensitivity**: 95.89 (% positive outcome)
- **Specificity**: 89.47 (% negative outcome)

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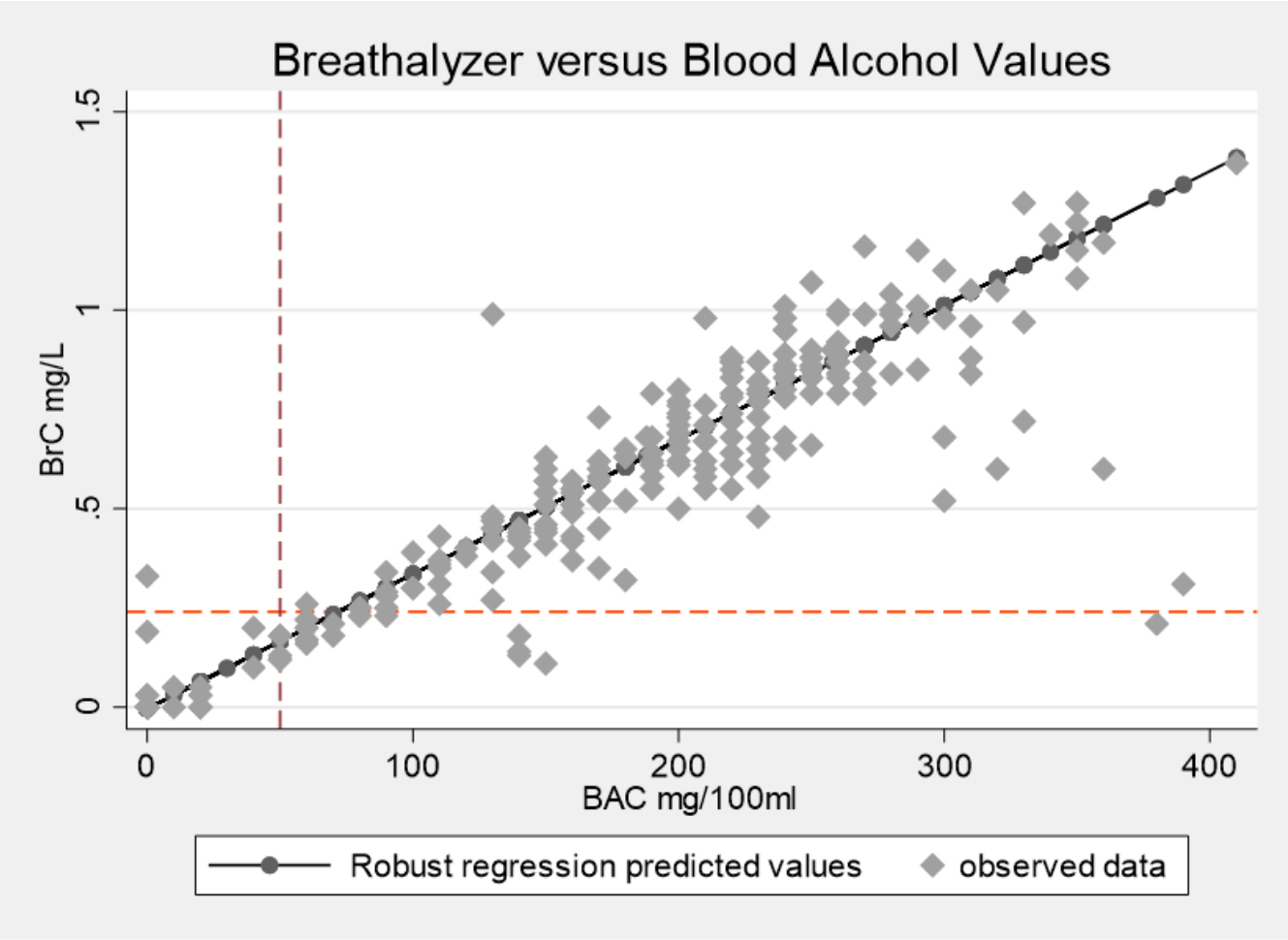
BAC VS ACTIVE BREATHALYZER –LINEAR REGRESSION



- Robust regression model fitted due to the outliers
- Regression line fits non-outlying data well, up to 250mg/100ml or 0.25g/100ml BAC
- 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

CONCLUSION

- Near perfect agreement: *BAC vs Passive testing* & *Passive vs Active* breathalyzer methods
- Results indicate that resource poor settings can reliably implement *passive breathalyzer testing* at a minimum, while BAC testing remains optimal
- Alcohol diagnostics can be useful to advocate for alcohol policy reform and to serve as a barometer for monitoring its impact
- In the South African setting, government should consider a surveillance system for periodic testing at sentinel sites

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

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