Waist circumference thresholds and 8-year incidence of type 2 diabetes in five African-origin populations

Data from the METS-study

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Modeling the Epidemiologic Transition Study

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Background

In 2021, **10.5%** of adults had diabetes

Almost half are unaware that they have the condition

The Sub-Saharan African region highest projected increase of

134% by 2040

Cost effective, accessible, and appropriate risk stratification strategies for Type 2 Diabetes (T2DM) needed for African-origin populations

IDF Diabetes Atlas, 10th ed. 2021

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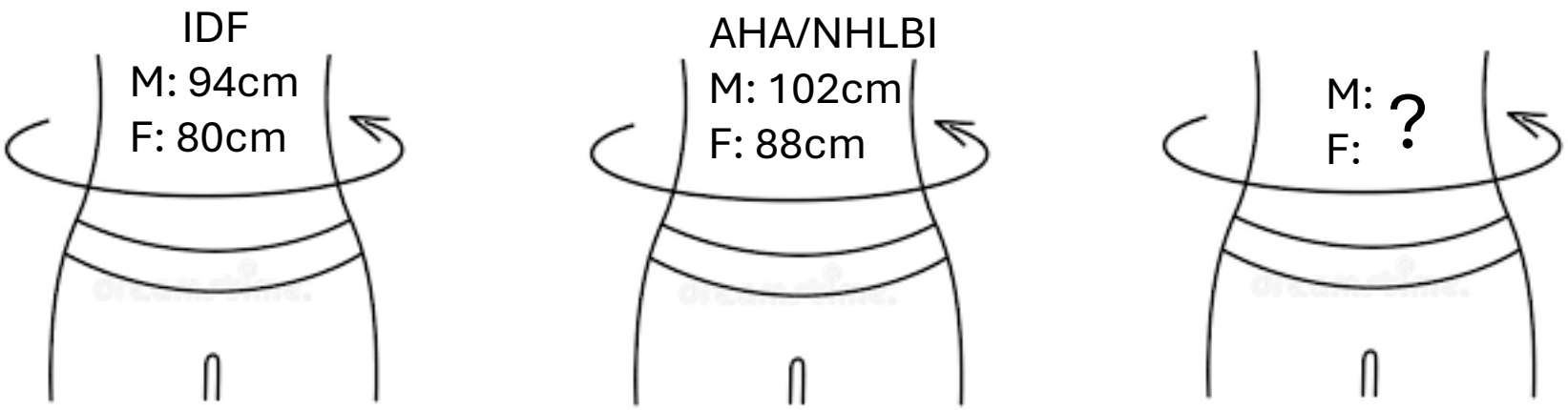
Background

- Waist circumference (WC) common proxy for central adiposity



- A particular waist circumference may not convey same degree of T2DM risk among different populations (Goedecke et al, 2021)
- Not confirmed across diverse African-origin populations

Goedecke et al, 2022
Alberti et al, 2009

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Aim

To explore waist circumference thresholds for T2DM risk prediction over an 8-year period, across five diverse African origin-populations

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Methods

Modelling the Epidemiologic Transition Study (METS)

2009-2011: **~2500 participants recruited (25-45 years old) from** Ghana, South Africa, Jamaica, Seychelles, USA

2017-2019: men and women with WC and glucose data; without T2DM at baseline

T2D definition

At follow-up, fasting plasma glucose ≥7mmol/L (≥126 mg/dL)

At baseline, capillary glucose ≥7mmol/L, except for Ghana, ≥11.1mmol/L (≥200 mg/dL)

Youden index to determine the optimal predictive WC threshold

McNemar's test to compare sensitivity/specificity

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Results

Baseline characteristics and T2DM at follow-up

	Men (n=339)					Women (n=494)				
	GHA	**RSA**	**JAM**	**SEY**	**USA**	**GHA**	**RSA**	**JAM**	**SEY**	**USA**
N	85	52	55	117	30	150	67	62	192	23
BMI category n (%)										
Underweight	1 (1.2)	7 (13.5)	4 (7.3)	2 (1.7)	1 (3.3)	2 (1.3)	0 (0)	3 (4.8)	6 (3.1)	1 (4.4)
Normal weight	63 (74.1)	41 (78.9)	35 (63.6)	45 (38.5)	7 (23.3)	74 (49.3)	15 (22.4)	15 (24.2)	67 (34.9)	1 (4.4)
Overweight	18 (21.2)	3 (5.8)	14 (25.5)	47 (40.2)	8 (26.7)	52 (34.7)	17 (25.4)	18 (29.0)	61 (31.8)	5 (21.7)
Obesity	3 (3.5)	1 (1.9)	2 (3.6)	23 (19.7)	14 (46.7)	22 (14.7)	35 (52.2)	26 (41.9)	58 (30.2)	16 (69.6)
WC, cm - median, IQR	77.4 (73.8, 83.5)	78.1 (73.0, 83.9)	76.9 (71.1, 88.4)	89 (82.0, 96.0)	91.6 (85.2, 111.5)	83.5 (76.5, 92.5)	95.8 (84.3, 110.5)	92.3 (83.6, 99.4)	86.0 (79.6, 95.8)	105.6 (87.5, 114.6)
T2DM at follow-up n (%)	3 (3.5)	2 (3.9)	1 (1.8)	12 (10.3)	2 (6.7)	5 (3.3)	1 (1.5)	3 (4.8)	7 (3.7)	3 (13.0)
	Total over all sites:		**20 (5.9)**			**Total over all sites:**		**19 (3.9)**		

Results

Compared to existing cut-points

	Men		
	Cut-off, cm	Sensitivity	Specificity
Derived (current study)	**83.3**	1 (0.83-1)*#	0.57 (0.51-0.62)*#
IDF	94	0.55 (0.32-0.77)	0.83 (0.79-0.87)
AHA/NHLBI	102	0.35 (0.15-0.59)	0.92 (0.88-0.95)
Goedecke et al - SA population	96.8	0.55 (0.32-0.77)	0.87 (0.83-0.91)

	Women		
	Cut-off, cm	Sensitivity	Specificity
Derived (current study)	**93.3**	0.89 (0.67-0.99)	0.67 (0.63-0.71)*#
IDF	80	0.95 (0.74-1.0)	0.27 (0.23-0.32)
AHA/NHLBI	88	0.89 (0.67-0.99)	0.53 (0.49-0.58)
Goedecke et al - SA population	95.8	0.79 (0.54-0.94)	0.73 (0.69-0.77)

* $p<0.05$ for difference between derived and IDF cut-off

# $p<0.05$ for difference between derived and AHA/NHLBI cut-off

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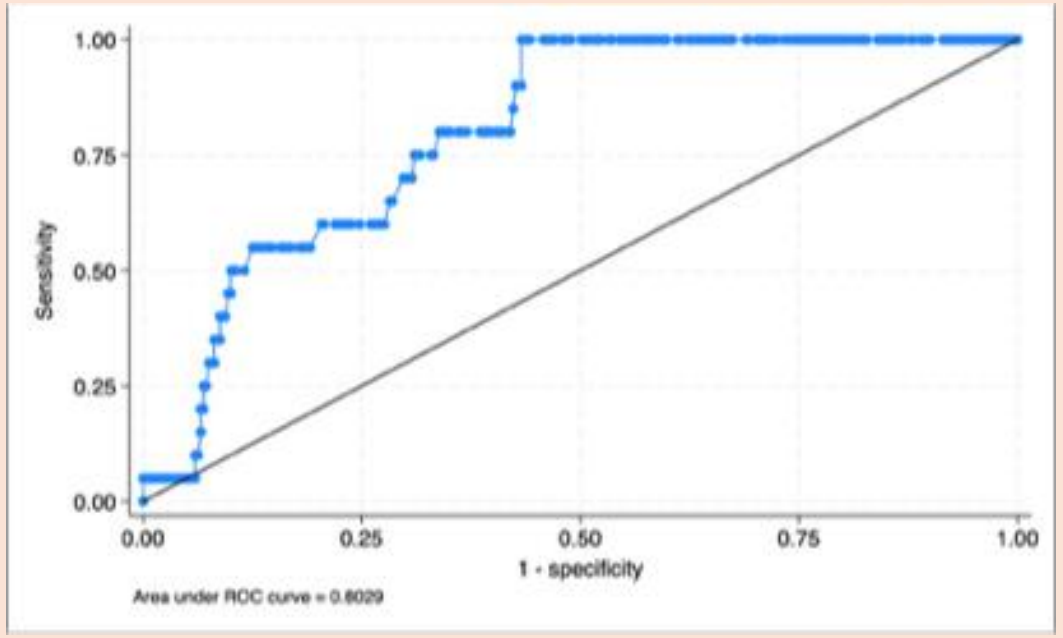
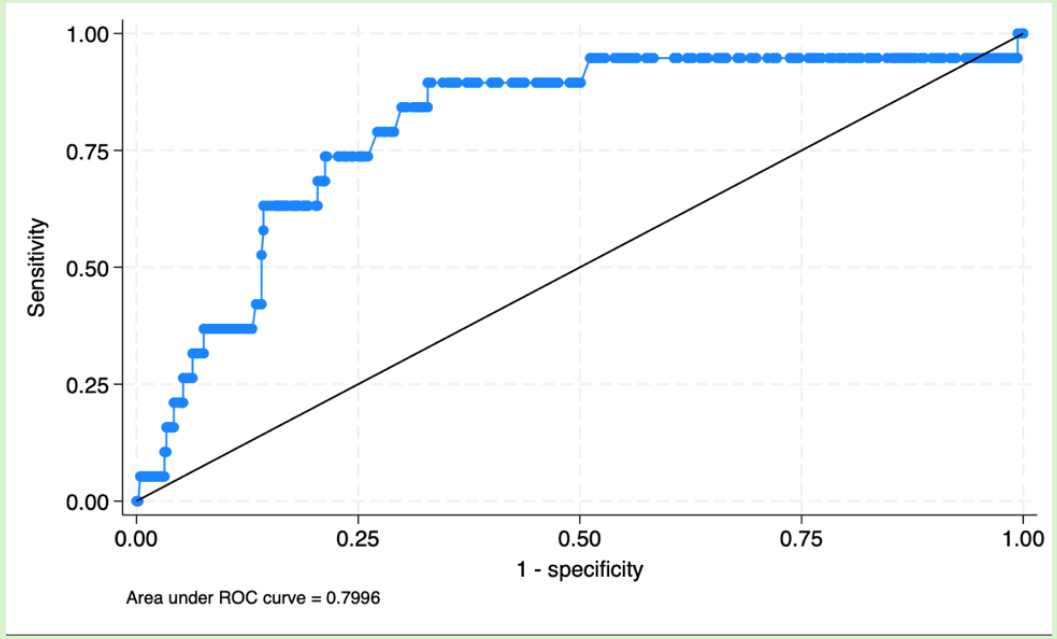
Men (n=339); Cases = 20 (5.9%)



Optimal cut-off	Youden index	Sensitivity	Specificity	AUROC
83.3 cm	0.57	1	0.57	0.78
African region; cases = 17 (6.7%)				
83.3 cm	0.57	1	0.57	0.78
Region of the Americas; cases = 3 (3.5%)				
98.7 cm	0.83	1	0.83	0.91

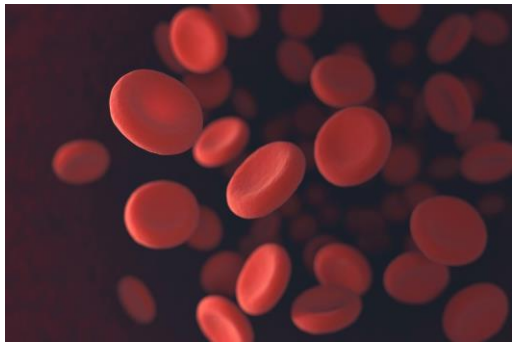
Women (n=494); Cases = 19 (3.9%)



Optimal cut-off	Youden index	Sensitivity	Specificity	AUROC
93.3 cm	0.57	0.89	0.67	0.78
African region; cases = 13 (3.2)				
94.9 cm	0.57	0.85	0.73	0.79
Region of the Americas; cases = 6 (7.1%)				
93.3 cm	0.51	1	0.51	0.75

Limitations

No full OGTT data available



Capillary glucose used for baseline

Small (per-site) sample size

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Conclusions

- Europid IDF WC threshold may not be appropriate for African-origin populations
- Among women, a higher WC threshold performs better, likely due to body fat distribution differences.
- WC thresholds vary by underlying obesity prevalence
- Supports the use of region-specific thresholds.

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