(P-0271)
Baseline body fat and fat distribution predicts T2D risk 11 years later in black SA women

A. Mtintsilana[1], L. Micklesfield[1], E. Chorell[2], T. Olsson[2], J. Goedecke[1,3],
[1]South African Medical Research Council/University of the Witwatersrand DPHRU, Department of Paediatrics, Wits, Johannesburg, SA
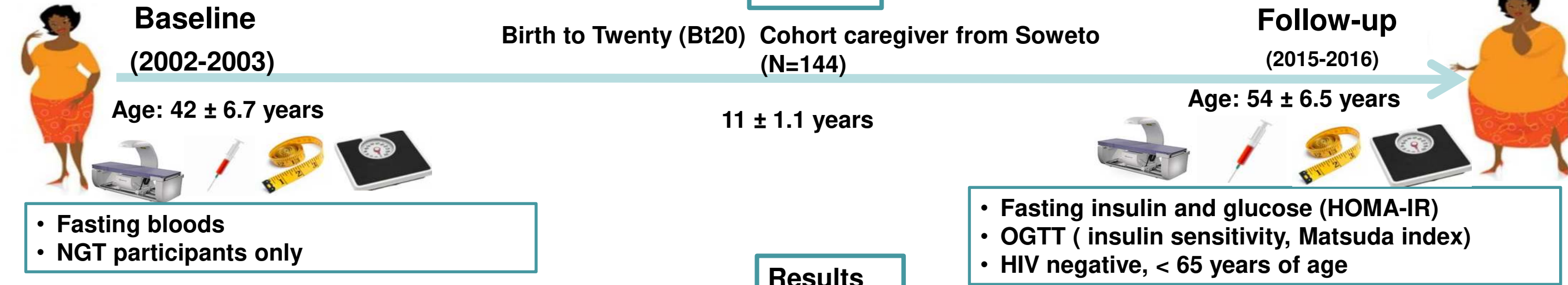[2]Department of Public Health and Clinical Medicine, Umeå University, Umeå, Sweden
[3]Non-Communicable Disease Research Unit, South African Medical Research Council, Cape Town, SA

Background: Central body fat distribution, specifically visceral adipose tissue (VAT), has been strongly associated with insulin resistance (IR) and type 2 diabetes (T2D). However, several cross-sectional studies from South Africa (SA) have shown that black SA women have less VAT and more abdominal and gluteal subcutaneous adipose tissue (SAT) than their white counterparts, despite being more insulin resistant (IR)

Aim: This longitudinal study aimed to investigate whether baseline and/or change in body fat and its distribution predict T2D risk in black SA women, 11 years later.

Methods

Baseline
(2002-2003)

Age: 42 ± 6.7 years

Birth to Twenty (Bt20) Cohort caregiver from Soweto (N=144)

11 ± 1.1 years

Follow-up
(2015-2016)

Age: 54 ± 6.5 years

- Fasting bloods
- NGT participants only

- Fasting insulin and glucose (HOMA-IR)
- OGTT (insulin sensitivity, Matsuda index)
- HIV negative, < 65 years of age

Results

Table 1: Subject characteristics at baseline and follow-up (n=144)

Variables	Baseline	Follow-up	Absolute change
Weight (kg)	77.1 ± 14.9	84.0 ± 17.4	7.0 ± 9.0*
BMI (kg/m^2)	30.8 ± 5.9	33.8 ± 6.9	3.0 ± 3.5*
WC (cm)	87.9 ± 11.6	99.4 ± 12.8	11.5 ±7.9 *
HC (cm)	114.4 ± 12.9	120.3 ± 13.8	5.9 ± 8.5*
WB FM (kg)	32.4 (25.3-40.1)	38.5 (30.0-48.0)	5.6 (0.9-12.9)*
Body fat (%)	46.7 (42.2- 50.4)	50.1 (45.2-53.9)	3.2 (1.3-6.4)*
Trunk (%FM)	44.0 (37.2-48.5)	48.8 (43.4-52.4)	4.2 (1.2-7.9)*
Leg (%FM)	50.0 (45.2-53.2)	51.7 (46.8-55.4)	2.4 (-0.9-5.0)*
VAT (cm^2)	118 (79-163)	167 (121-204)	43 (12 -87)*

Data presented as means ± SD or median (25th-75th percentiles). BMI, body mass index; WC, waist circumference; HC, hip circumference; WB FM, whole body fat mass. All measurements significantly increased from baseline to follow-up, *p-value < 0.0001.

Table 3: Regression coefficients from robust multiple linear models for the prediction of HOMA-IR and insulin sensitivity at follow-up

Predictor variable	Insulin resistance (HOMA-IR)				Insulin sensitivity (Matsuda)			
	β	p	95% CI	R^2	β	p	95% CI	R^2
WB FM (kg)*								
Baseline	0.03	0.00	0.01-0.05	0.07	-0.06	0.03	-0.11- -0.00	0.04
Change	-0.01	0.32	-0.02-0.01		0.02	0.28	-0.02-0.07	
Trunk FM (kg)*								
Baseline	0.23	0.00	0.10-0.35		-0.58	0.00	-0.93- -0.23	0.09
Change	-0.01	0.62	-0.04-0.02	0.13	0.02	0.57	-0.06-0.10	
WB FM	-0.08	0.01	-0.14- -0.02		0.21	0.01	0.04-0.37	
Leg FM (kg)*								
Baseline	-0.17	0.00	-0.27- -0.06		0.43	0.01	0.13-0.73	
Change	0.01	0.88	-0.04-0.03	0.12	0.03	0.56	-0.06-0.12	0.07
WB FM	0.10	0.00	0.06-0.14		-0.25	0.00	-0.39- -0.11	
VAT (cm^2)*								
Baseline	0.01	0.05	-0.00-0.01		-0.01	0.07	-0.03- -0.00	
Change	-0.00	0.17	-0.01-0.00	0.11	-0.00	0.47	-0.01-0.01	0.06
WB FM	0.00	0.75	-0.02-0.03		-0.00	0.90	-0.08-0.07	

Data presented as β-coefficients, 95% confidence intervals and R^2 for each model, p-values adjusted for age. Each model includes "baseline" and "change" in body fat and fat distribution variable. WB FM, whole body fat mass. * Model p-value <0.05.
Abdominal SAT area was not associated with HOMA-IR and insulin sensitivity (Matsuda index).

Table 2: DXA-derived measures of body composition as predictors of IGT and T2D at follow-up, results from the multinomial logistic models

Predictor variable	Outcome variable	RRR	p	95% CI
Trunk FM (kg) *				
Baseline		1.65	0.00	1.18-2.30
Change	NGT to IGT	1.02	0.56	0.95-1.10
WB FM		0.79	0.00	0.67-0.93
Baseline		2.64	0.00	1.60-4.30
Change	NGT to T2D	1.01	0.88	0.90-1.13
WB FM		0.65	0.00	0.50-0.83
Leg FM (kg) *				
Baseline		0.62	0.00	0.46-0.82
Change	NGT to IGT	1.02	0.63	0.94-1.11
WB FM		1.21	0.00	1.07-1.37
Baseline		0.42	0.00	0.28-0.65
Change	NGT to T2D	1.04	0.61	0.91-1.19
WB FM		1.45	0.00	1.22-1.72
VAT (cm^2) *				
Baseline		1.01	0.03	1.00-1.03
Change	NGT to IGT	1.00	0.73	0.99-1.01
WB FM		0.94	0.06	0.88-1.00
Baseline		1.02	0.01	1.01-1.04
Change	NGT to T2D	1.00	0.55	0.99-1.01
WB FM		0.94	0.17	0.86-1.02

Data presented as relative risk ratio (RRR) and 95% confidence interval (CI), p-values adjusted for age. Each model includes "baseline" and "change" in body fat and fat distribution variable. Outcomes are 3 disease risk categorical variables; those who remained NGT (normal glucose tolerance, reference, n=90), those who transitioned to IGT (impaired glucose tolerance, n=36) and those who developed T2D (type 2 diabetes, n=16) at follow-up. WB FM, whole body fat mass (kg). * Model p- value <0.05. WB FM (kg) and SAT (cm^2) did not predict development of IGT and T2D.

Discussion: Baseline, rather than the change in body fat and fat distribution, predicted measures of T2D risk 11 years later. Specifically, measures of central FM (i.e. trunk and VAT) were associated with reduced insulin sensitivity and increased risk for the progression of NGT to IGT, and T2D. In contrast, baseline peripheral FM (i.e. leg FM) was associated with increased insulin sensitivity and reduced risk for the progression of NGT to IGT, and T2D.

Conclusion: Prevention of obesity, in particular the prevention of centralization of body fat, is essential to reduce the risk of developing T2D in black South African women.