Cardio-metabolic disease risk and HIV status in rural South Africa: establishing a baseline

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INDEPTH Network ISC 2015
Addis Ababa, Ethiopia, 11 – 13 November

Clark et al. BMC Public Health (2015) 15:135
DOI 10.1186/s12889-015-1467-1

BMC Public Health

RESEARCH ARTICLE Open Access

Cardiometabolic disease risk and HIV status in rural South Africa: establishing a baseline

Samuel J Clark[1,2,3,6,7], F Xavier Gómez-Olivé[1,6], Brian Houle[1,2,9*], Margaret Thorogood[1,3,8], Kerstin Klipstein-Grobusch[3,4], Nicole Angotti[1,2,3,10], Chodziwadziwa Kabudula[1,6], Jill Williams[2,3], Jane Menken[2,3] and Stephen Tollman[1,3,5,6]

Abstract

Background: To inform health care and training, resource and research priorities, it is essential to establish how non-communicable disease risk factors vary by HIV-status in high HIV burden areas; and whether long-term anti-retroviral therapy (ART) plays a modifying role.

Methods: As part of a cohort initiation, we conducted a baseline HIV/cardiometabolic risk factor survey in 2010–2011 using an age-sex stratified random sample of ages 15+ in rural South Africa. We modelled cardiometabolic risk factors and their associations by HIV-status and self-reported ART status for ages 18+ using sex-stratified logistic regression models.

Results: Age-standardised HIV prevalence in women was 26% (95% CI 24-28%) and 19% (95% CI 17–21) in men. People with untreated HIV were less likely to have a high waist circumference in both women (OR 0.67; 95% CI 0.52-0.86) and men (OR 0.42; 95% CI 0.22-0.82). Untreated women were more likely to have low HDL and LDL, and treated women high triglycerides. Cardiometabolic risk factors increased with age except low HDL. The prevalence of hypertension was high (40% in women; 30% in men).

Conclusions: Sub-Saharan Africa is facing intersecting epidemics of HIV and hypertension. In this setting, around half the adult population require long-term care for at least one of HIV, hypertension or diabetes. Together with the adverse effects that HIV and its treatment have on lipids, this may have serious implications for the South African health care system. Monitoring of the interaction of HIV, ART use, and cardiometabolic disease is needed at both individual and population levels.

Keywords: South Africa, Rural, Cardiometabolic risk, HIV/AIDS

BMC Public Health 2015; 15: 135-143

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Medical Research Council/ Wits University
Rural Public Health and Heath Transitions Research Unit

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Background

- The world population is aging: 2050 will see population older than 60 outnumbering children under 15 years of age.
- Low and middle income countries will experience a 140% increase in population 60 years and older by 2030, hosting 75% of the older population worldwide.
- The aging of the population will bring an increase of deaths due to NCDs: in 2010 reached 34.5 million worldwide (65.5% of all deaths) being 80% of them in LMIC.
- At present there are 35 million people living with HIV, 70% of them in sub-Saharan Africa.

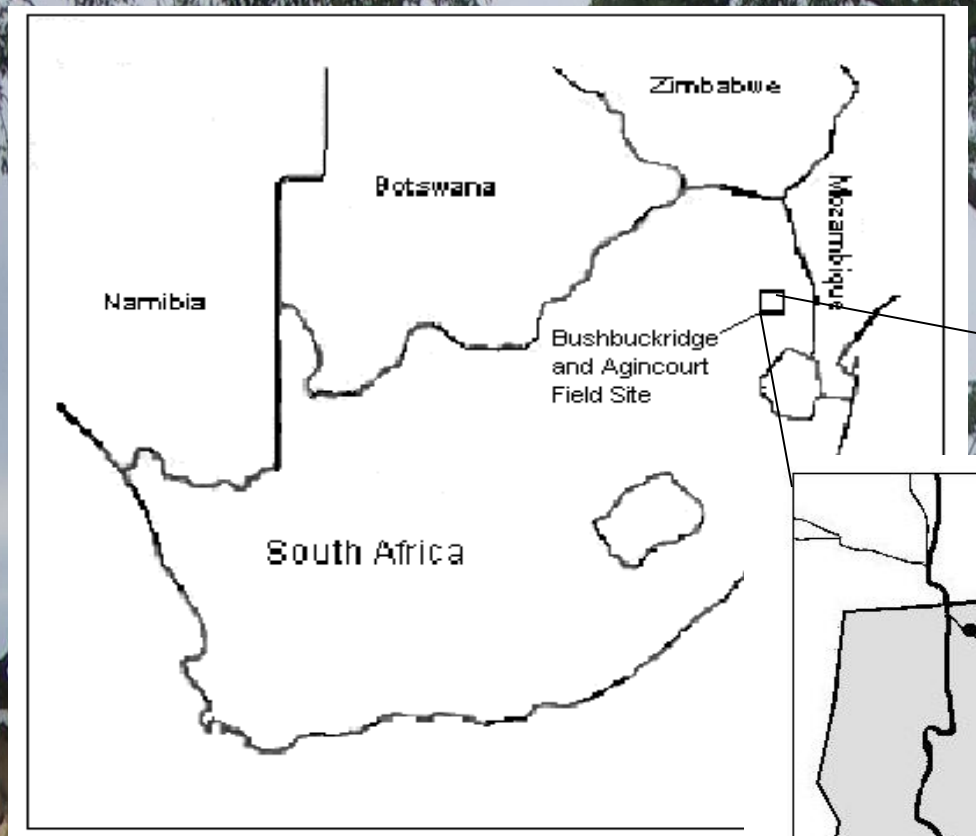
Double epidemic in South Africa

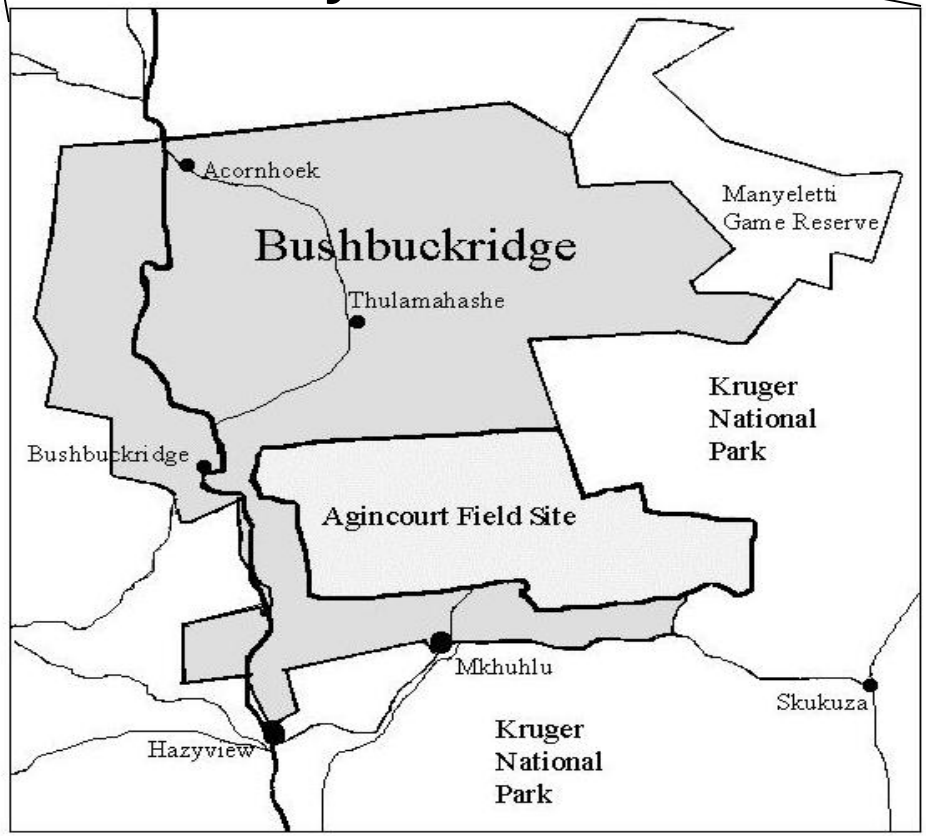
- South Africa faces an epidemic of non-communicable diseases and their risk factors together with an aging population.
- Among national SAGE studies, South Africa had the highest hypertension prevalence (78%).
- South Africa faces a huge epidemic of HIV with national prevalence in 2011 of 11% for all ages (5.4 million people).
- The ART program in South Africa is the largest worldwide increasing life expectancy in HIV+ population.

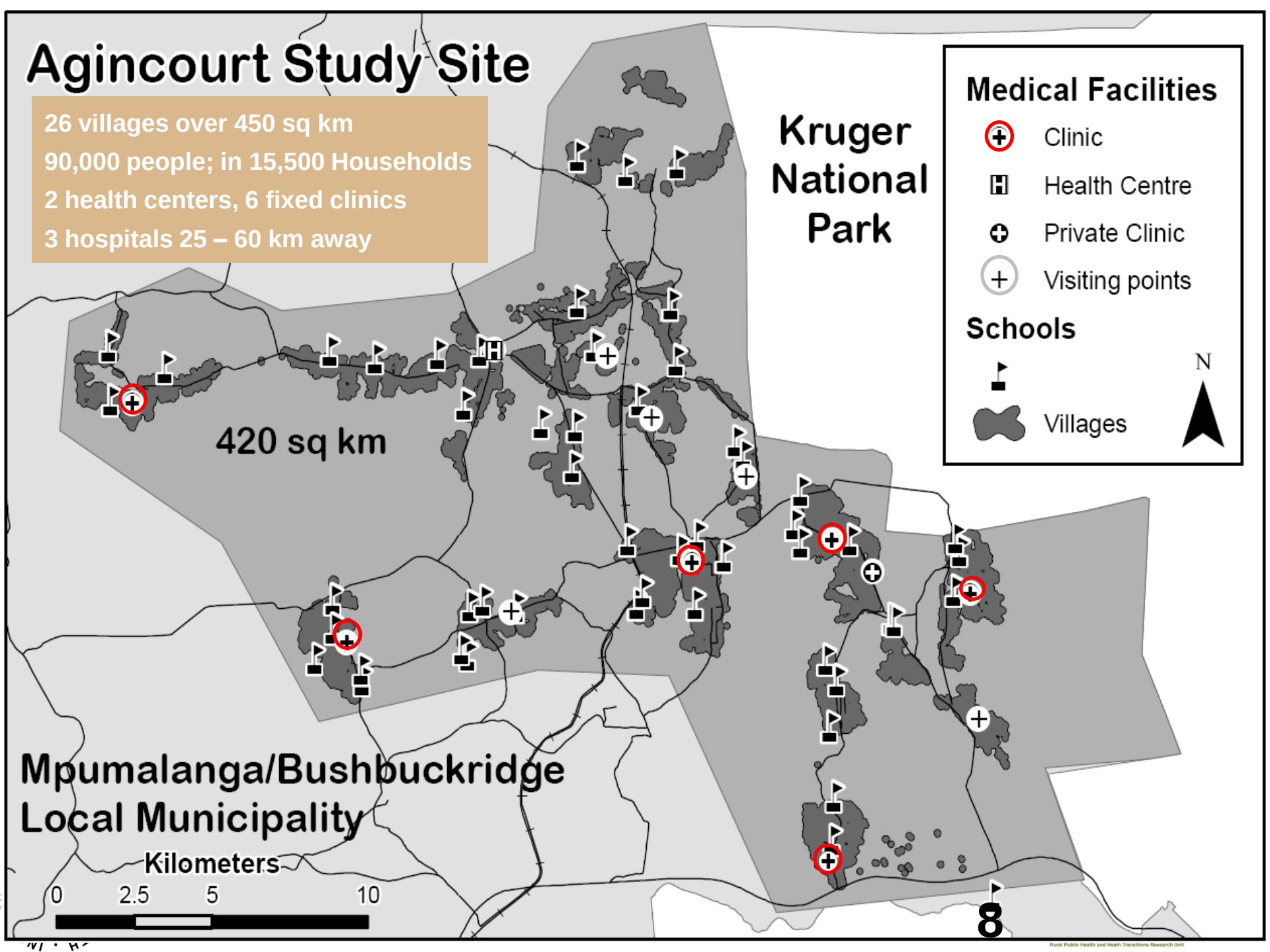
Research questions

- Is there an interaction between the HIV and NCD epidemics?
- What is the role of ARTs in these interaction?
- How is these dual epidemic increasing the need for chronic care at Primary Health Care level?

STUDY SITE:
Agincourt Health and Demographic Surveillance System





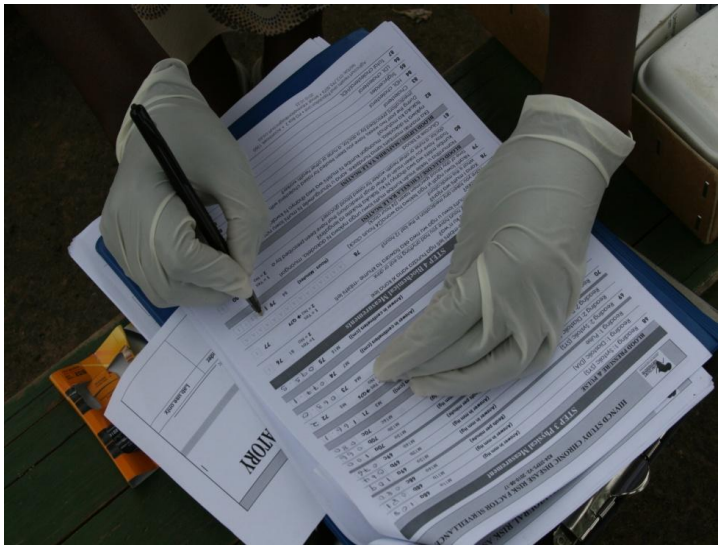

Agincourt Study Site
26 villages over 450 sq km
90,000 people; in 15,500 Households
2 health centers, 6 fixed clinics
3 hospitals 25 – 60 km away
Kruger National Park
420 sq km
Medical Facilities
Clinic
Health Centre
Private Clinic
Visiting points
Schools
Villages
N
Mpumalanga/Bushbuckridge Local Municipality
Kilometers
0
2.5
5
10
8

Methods: sample

- Field work August 2010 – June 2011
- Inclusion criteria:
  - men and women aged 15 and older
  - permanent residents the year prior to 2009 census.
- Random sample of 7,662/34,413 men and women eligible from the 2009 HDSS census:
  - Consented to be interviewed and tested (n = 4362)
  - For this paper estimation sample was restricted to ages 18+ with complete covariate data (n = 3641).
- Age-sex stratified sample including an oversample of 284 adults 50+ years from a prior adult health study.

Methods: household visits

- Written informed consent.
- Questionnaires:
  - Sexual behavior
  - Adapted STEPS questionnaire
- Anthropometric measurements:
  - Height, weight, blood pressure
- Biomarkers by finger prick:
  - Five dried blood spots: HIV
  - Point of care: lipids, glucose
- Participants with abnormal results were referred to the closest clinic.
- HIV results were available in two health centers



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Analysis

- Unadjusted prevalence of HIV and cardio-metabolic risk factors by sex.
- Age-adjusted prevalence using the 2009 census population.
- Logistic regression to assess associations between cardio-metabolic risk factors, HIV-status and socio-demographic variables.

Cardio-metabolic risk factors

Risk factors	Men	Women
High waist circumference	> 102 cm	> 88cm
Obesity (body mass index - kg/m2)	≥ 30	
Hypertension	Systolic BP ≥ 140 mmHg or Diastolic BP ≥ 90 mmHg or Anti-hypertensive medication use	
Low HDL cholesterol	< 1.03 mmol/L	< 1.29 mmol/L
High LDL cholesterol	> 3 mmol/L	
High Triglycerides	≥ 1.7 mmol/L	
Diabetes (random glucose)	≥ 11.1 mmol/L	

Self-reported use of ART

		Final HIV Status				
		Positive	Negative			
Reported Under ART	Yes	249	6	255	**PPV**	97,6
	No	533	1477	2010	**NPV**	73,5
		782	1483	2265		

Sensitivity	**Specificity**
31,8	99,6

Only half of those 533 HIV+ who reported not using ART reported knowing their HIV status

RESULTS

Demographic and lifestyle by sex

	Women (%) (N = 2163)	Men (%) (N = 1478)
Age (years)		
18-29	38	64
30-49	31	15
50+	31	21
Formal education, years		
None	23	11
1-5	10	10
6+	67	80
Ever smoked	1	21
Currently employed	14	15
Alcohol frequency, past 30 days		
None	94	67
1 – 3 days/month	4	17
1 – 4 days/week	2	12
5+ days/week	1	4
Physical activity score[a]		
Low	47	38
Moderate	34	40
High	18	22

[a]Based on the International Physical Activity Questionnaire (IPAQ).

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Measured and Adjusted HIV prevalence

	Measured (95% CI)				Adjusted	
Age	**Female**		**Male**		**Female**	**Male**
15-19	**5.5**	(2.6 - 8.4)	**0.4**	(0.0 - 1.3)	5.6	0.8
20-24	**27.0**	(21.9 - 32.2)	**6.1**	(2.9 - 9.4)	26.9	8.3
25-29	**37.8**	(32.1 - 43.4)	**21.7**	(15.2 - 28.3)	38.3	28.8
30-34	**41.8**	(36.2 - 47.3)	**41.8**	(33.7 - 50.0)	41.4	46.6
35-39	**46.1**	(40.7 - 51.6)	**45.3**	(38.1 - 52.6)	46.9	48.3
40-44	**34.4**	(28.1 - 40.8)	**41.0**	(31.4 - 50.6)	35.8	45.5
45-49	**34.2**	(28.0 - 40.4)	**28.8**	(20.9 - 36.7)	35.1	32.6
50-54	**26.9**	(19.4 - 34.4)	**30.6**	(19.9 - 41.2)	26.9	35.8
55-59	**26.8**	(19.5 - 34.0)	**34.6**	(24.2 - 44.9)	27.1	34.9
60-64	**13.1**	(7.6 - 18.6)	**19.8**	(12.4 - 27.2)	14.6	21.7
65-69	**10.3**	(5.2 - 15.4)	**16.5**	(8.9 - 24.1)	12.1	18.1
70-74	**11.0**	(4.6 - 17.4)	**5.7**	(0.8 - 10.5)	12.2	6.2
75-79	**6.2**	(0.9 - 11.4)	**5.3**	(0.0 - 12.4)	7.4	6.2
80-84	**1.3**	(0.0 - 3.8)	**1.8**	(0.0 - 5.3)	1.7	2.7
15-84	**23.9**	(22.2 - 25.6)	**10.6**	(9.3 - 12.0)	25.4	16.9

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Unadjusted and age-adjusted prevalence of HIV and cardio-metabolic risk factors by sex

	Women		Men	
	Unadjusted % [95% CI]	Age-adjusted % [95% CI]	Unadjusted % [95% CI]	Age-adjusted % [95% CI]
HIV +	23 [21, 24]	26 [24, 28]	10 [9, 11]	19 [17, 21]
Hypertension (whole sample)	40 [38, 43]	39 [37, 41]	30 [27, 33]	37 [35, 40]
Hypertension (HIV negative)	40 [38, 43]	40 [37, 42]	29 [26, 32]	37 [35, 41]
High waist circumference	42 [40, 45]	43 [41, 45]	4 [3, 5]	6 [5, 8]
Probable diabetes	3 [2, 4]	2 [2, 3]	1 [1, 2]	2 [1, 3]
Obesity	25 [23, 27]	26 [24, 28]	5 [3, 6]	7 [5, 8]
High Triglycerides	23 [21, 25]	22 [22, 23]	20 [17, 22]	24 [22, 27]
High LDL cholesterol	31 [28, 33]	28 [25, 30]	14 [11, 16]	17 [15, 20]
Low HDL cholesterol	28 [26, 30]	29 [27, 32]	16 [14, 19]	12 [10, 14]
Any condition requiring chronic care	54 [52, 57]	56 [53, 58]	36 [33, 40]	49 [46, 51]

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Association of HIV and ART status with cardio-metabolic risk factors

	Obesity	High WC	HT	Diabetes	High triglycerides	High LDL cholesterol	Low HDL cholesterol
HIV status	**Women** (Odds ratio [95% CI]						
HIV-	Reference	Reference	Reference	Reference	Reference	Reference	Reference
HIV+, no ART	0.64 [0.49-0.85]	0.67 [0.52-0.86]	0.82 [0.63-1.07]	0.40 [0.15-1.04]	NS	0.53 [0.38-0.73]	1.38 [1.06-1.81]
HIV+, on ART	0.27 [0.15-0.46]	0.50 [0.33-0.76]	0.64 [0.18-2.23]	0.74 [0.49-1.10]	1.65 [1.10-2.48]	NS	0.56 [0.33-0.95]
	Men (Odds ratio [95% CI]						
HIV-	Reference	Reference	Reference	Reference	Reference	Reference	Reference
HIV+, no ART	NS	0.42 [0.22-0.82]	0.76 [0.52-1.11]	1.13 [0.46-2.75]	NS	0.42 [0.25-0.72]	NS
HIV+, on ART	NS	NS	1.23 [0.70-2.17]	1.00 [0.20-5.11]	NS	NS	NS

Adjusted for age, education, household SES, physical activity, and alcohol use.

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Duration of HIV infection and hypertension risk

Covariate (n=1131)	**Hypertension** Odds Ratio + 95% CI
Age	1.058 (1.044 – 1.070)
Female	1.405 (1.029 – 1.656)
BMI	1.058 (1.037 – 1.081)
Education	0.985 (0.998 – 1.045)
Ever Smoker	1.025 (0.659 – 1.595)
HIV ≥ 5 years	0.540 (0.392 – 0.743)
HIV < 5 years	1.591 (0.659 – 3.837)

ART Use & Access to Care for NCDs

	Ever Use of ART Odds Ratio + 95% CI
Ever Measured BP	1.61 (1.14 – 2.27)
Ever Measured Blood Sugar	1.94 (1.43 – 2.63)
Told to Change Diet	2.88 (1.70 – 4.88)
Told to Exercise	2.39 (1.18 – 4.81)

**N =728 for all models*
**All models adjusted for age, sex, BMI and educational attainment*

Conclusion

- HIV + infected women not on ART have reduced number of cardio-metabolic risk factors compared to HIV – except for low HDL
- We do not see the expected increase of cardio-metabolic risk factors on those women on ART except for higher levels of TG
- Men on ART do not present any increase of CM risk
- People HIV+/Ever on ART have lower levels of high blood pressure after 5 years of infection possibly due to a higher contact with health facilities.

Conclusions (cont.)

- South Africa is experiencing a dual epidemic of cardio-metabolic risk factors and HIV with an increasing need for chronic care.
- There is a need to integrate all chronic disease services or at least incorporate NCD preventive advice and BP measurement in HIV programs and HIV testing in NCD services.