

Supplementary Material

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Title: National South African HIV prevalence estimates robust despite substantial test non-participation

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Supplementary Table 1: Tests of association between interviewer identity and willingness to consent

	<u>Non-consent to interview</u>		<u>Non-consent to test</u>	
0-14 year olds				
Male	$F_{(293, 2280)}$	2.12	$F_{(302, 2556)}$	3.33
Female	$F_{(305, 3478)}$	2.23	$F_{(311, 4084)}$	4.57
15 years and above				
Male	$F_{(323, 10619)}$	4.52	$F_{(322, 11112)}$	7.08
Female	$F_{(319, 13035)}$	4.85	$F_{(322, 14635)}$	9.04

F tests are obtained by testing the null hypothesis that all interviewer identity indicator variables are jointly equal to zero in a linear regression model for consent as the outcome, including all observed covariates. F-tests are for the given number of observations. All tests have p-values < 0.001.

Supplementary Table 2: Response rates for behavioural survey and HIV test

	Not interviewed		Not tested for HIV		Tested for HIV		Total
< 12 years old	392	4.1%	2,895	30.4%	6,236	65.5%	9,523
12-14 years old	134	6.0%	389	17.4%	1,713	76.6%	2,236
Male, 15-49 years old	1,803	17.5%	2,025	19.7%	6,460	62.8%	10,288
Female, 15-49 years old	1,179	10.2%	2,177	18.8%	8,243	71.1%	11,599
Male, ≥ 49 years old	508	14.2%	790	22.0%	2,289	63.8%	3,587
Female, ≥ 49 years old	400	7.8%	1,043	20.4%	3,681	71.8%	5,124
All ages	4,416	10.4%	9,319	22.0%	28,622	67.6%	42,357

Percentages are proportions of all individuals of a given age/sex category in the relevant response group. Figures differ slightly from those in **Error! Reference source not found.** due to 593 individuals excluded from this sample due to an inability to link individual and household information on them.

Supplementary Table 3: Nationally weighted population proportions based on final analytic sample

	Female					Male				
	All	No test	HIV-	HIV+		All	No test	HIV-	HIV+	
Total		21.9	62.3	15.9			25.0	64.9	10.0	
Age										
15-19	13.5	9.8	17.2	4.0		14.6	9.9	18.6	1.0	
20-24	12.9	11.3	13.8	11.5		14.2	12.7	16.0	6.4	
25-29	12.3	12.7	10.6	18.3		13.3	12.9	12.8	18.1	
30-34	11.1	12.1	8.3	20.6		12.3	13.1	10.5	21.9	
35-39	10.2	10.9	8.1	17.6		10.9	12.7	8.3	22.8	
40-44	8.6	8.7	7.7	11.9		8.5	9.9	7.7	10.4	
45-49	7.1	8.2	6.7	7.0		6.8	7.7	6.4	7.5	
50-54	6.4	6.5	6.7	4.6		5.9	6.5	5.6	6.8	
55-59	5.0	5.5	5.4	2.7		4.6	5.0	4.8	2.3	
60+	12.9	14.3	15.3	1.8	23.94	8.7	9.6	9.3	3.0	15.16
					0.000					0.000
Race										
African	77.7	64.7	77.3	97.5		77.6	67.2	78.6	97.0	
White	10.2	21.6	8.8	0.2		10.3	20.5	8.0	0.2	
Coloured	9.4	8.2	11.6	2.2		9.2	7.7	10.7	2.7	
Indian/Asian	2.7	5.5	2.3	0.1	82.30	2.9	4.5	2.7	0.2	51.49
					0.000					0.000
Language										
Afrikaans	13.7	17.4	15.2	2.6		13.9	17.8	14.0	3.5	
English	9.7	18.7	8.7	1.5		10.2	16.8	9.1	1.0	
IsiNdebele	1.9	0.7	2.4	1.3		2.2	2.1	2.2	2.1	
SiSwati	2.3	2.9	1.7	3.9		2.1	2.2	1.8	3.7	
IsiXhosa	15.1	11.1	15.8	17.9		15.9	12.4	16.9	18.2	
IsiZulu	23.8	16.9	22.1	39.6		21.4	17.5	21.2	33.0	
Sesotho	9.0	8.9	8.4	11.3		9.2	6.6	9.2	15.5	
Sepedi	9.1	7.9	10.0	7.3		9.8	10.6	9.7	8.3	
Setswana	7.8	6.8	8.3	7.6		7.6	6.2	8.2	8.0	
Tshivenda	2.0	2.0	2.1	1.5		1.6	1.4	1.9	0.5	
Xitsonga	3.9	4.1	3.6	4.8		4.1	4.2	4.1	4.1	
Other	0.6	0.9	0.6	0.2		1.2	1.3	1.1	0.9	
Missing	1.2	1.8	1.1	0.6	12.12	0.7	1.0	0.5	1.3	6.09
					0.000					0.000
Marital status										
Single	22.4	22.7	22.4	21.8		26.3	22.5	29.1	17.4	
Married/civil union	30.3	39.7	30.7	15.8		31.4	40.3	29.5	22.1	
Going steady/living together	32.1	23.2	30.1	52.1		35.5	29.7	34.9	53.8	
Widowed	9.9	8.7	11.1	6.6		2.5	2.3	2.4	3.1	
Divorced	3.5	3.1	4.0	2.2		2.1	2.4	2.0	1.9	
Other/Missing	1.8	2.5	1.6	1.4	25.93	2.2	2.8	2.1	1.8	11.40
					0.000					0.000

	Female					Male				
	All	No test	HIV-	HIV+		All	No test	HIV-	HIV+	
Location type										
Urban formal	51.9	69.2	50.2	35.0		52.0	65.8	48.2	41.5	
Urban informal	7.4	6.4	6.5	12.2		8.3	5.6	8.5	13.5	
Rural informal	36.2	20.2	38.6	48.9		33.2	21.9	36.8	37.8	
Rural formal	4.5	4.1	4.8	3.9	25.08	6.6	6.8	6.4	7.2	10.57
					0.000					0.000
Education attainment										
None or primary	14.9	7.5	16.5	18.7		15.7	9.5	17.3	21.1	
Incomplete secondary	35.3	28.8	35.9	42.0		35.7	28.1	38.3	37.9	
Complete secondary	25.0	31.1	23.6	22.4		24.5	30.9	22.2	22.7	
Any post-secondary	9.1	15.3	8.3	3.9		10.1	16.3	8.7	3.6	
Missing	15.7	17.2	15.8	13.0	19.71	13.9	15.1	13.4	14.7	12.77
					0.000					0.000
Household wealth										
Lowest	17.7	32.4	16.4	2.6		22.1	30.0	16.9	3.2	
2nd lowest	12.3	13.8	13.0	7.4		22.3	14.0	11.8	9.4	
Middle	19.1	20.1	18.6	19.3		24.8	18.5	19.9	20.8	
2nd highest	22.9	15.9	23.3	31.0		12.2	16.8	21.2	28.2	
Highest	21.1	10.5	21.7	33.4		11.8	13.5	23.5	32.2	
Missing	6.9	7.3	6.9	6.3	29.82	6.8	7.1	6.8	6.2	16.41
					0.000					0.000
Province										
Western Cape	12.3	13.6	13.9	4.1		12.2	12.2	13.3	5.2	
Eastern Cape	11.2	6.4	12.4	13.1		12.7	8.7	14.0	14.4	
Northern Cape	2.2	1.7	2.6	1.2		2.2	1.5	2.5	2.2	
Free State	5.2	5.2	4.9	6.1		5.6	6.0	5.3	6.8	
KwaZulu-Natal	19.4	13.4	18.6	30.7		17.5	14.6	17.3	26.2	
North West	6.7	5.9	6.7	7.5		7.2	6.3	7.6	6.7	
Gauteng	25.5	38.6	22.5	19.4		25.4	35.7	21.7	23.6	
Mpumalanga	7.1	5.6	7.1	9.2		8.1	5.7	8.8	9.6	
Limpopo	10.6	9.6	11.4	8.6	11.33	9.1	9.3	9.6	5.2	6.33
					0.000					0.000
High-risk alcohol consumption										
No	86.6	84.1	87.1	88.2		71.8	72.3	72.1	69.2	
Yes	3.1	3.7	3.0	2.8		16.2	15.5	16.3	17.5	
Missing	10.3	12.2	9.9	9.0	1.95	12.0	12.3	11.6	13.3	0.49
					0.111					0.734
Any drug use										
No	96.0	95.6	95.8	97.2		88.4	90.5	87.7	87.7	
Yes	2.8	2.6	3.1	1.9		10.3	6.8	11.4	11.2	
Missing	1.2	1.8	1.1	0.9	2.82	1.3	2.7	0.9	1.1	9.32
					0.027					0.000
Any disability										
No	93.9	93.0	94.3	93.6		92.2	92.8	92.2	90.8	
Yes	4.3	4.5	4.3	3.9		6.0	4.7	6.3	7.7	
Missing	1.8	2.6	1.4	2.5	2.16	1.8	2.5	1.5	1.5	2.44
					0.077					0.050

	Female					Male				
	All	No test	HIV-	HIV+		All	No test	HIV-	HIV+	
Victim of crime in past 12 months										
No	5.9	8.1	5.6	4.1		88.5	9.3	10.0	10.2	
Yes	92.8	89.9	93.3	95.1		9.9	88.1	88.6	88.4	
Missing	1.2	2.0	1.1	0.8	6.52	1.6	2.5	1.3	1.4	1.47
					0.000					0.210
Age at first sex										
Under 16	8.8	7.1	8.4	12.8		14.5	11.8	15.1	18.0	
16-17	19.4	14.2	19.8	24.7		19.0	18.3	19.1	20.0	
18-20	34.9	32.1	34.3	40.8		26.4	23.2	26.6	33.4	
Over 21	16.5	21.7	15.8	12.4		15.2	19.5	13.7	14.4	
Not applicable	12.0	13.1	14.0	2.9		14.3	11.9	16.9	3.1	
Missing	8.4	11.8	7.7	6.3	17.92	10.5	15.3	8.6	11.1	9.80
					0.000					0.000
Partners in past 12 months										
0	38.9	38.2	41.6	29.5		29.7	25.0	33.3	18.1	
1	55.7	55.1	53.5	64.8		53.6	56.1	51.1	63.2	
> 1	2.7	2.1	2.4	4.3		13.5	13.4	13.1	16.3	
Missing	2.7	4.5	2.4	1.4	11.44	3.3	5.5	2.5	2.4	11.81
					0.000					0.000
Partner forced sex in past 12 months										
No	56.3	57.9	54.3	62.2		63.6	68.3	60.2	73.8	
Yes	1.0	1.2	0.9	1.3		0.6	0.2	0.7	0.6	
Missing	42.6	40.9	44.8	36.5	4.67	35.8	31.4	39.0	25.5	10.99
					0.001					0.000
Had concurrent partners in past 12 months										
No	95.4	93.8	95.8	95.9		85.7	83.8	86.8	83.6	
Yes	0.7	0.8	0.6	0.7		4.5	3.8	4.5	6.4	
Missing	3.9	5.4	3.6	3.4	2.68	9.8	12.4	8.7	10.0	3.54
					0.034					0.008
Thinks partner had concurrent partners in past 12 months										
No	67.5	69.8	70.5	52.2		70.2	70.3	71.9	58.4	
Don't know	11.4	9.5	10.4	18.1		10.6	8.8	10.9	13.4	
Yes	16.7	14.8	15.0	26.2		14.5	14.5	13.2	22.8	
Missing	4.4	5.9	4.1	3.5	19.33	4.7	6.4	4.0	5.4	5.74
					0.000					0.000
Lifetime number of partners										
0	12.0	13.0	14.0	2.9		14.3	11.9	16.9	3.1	
1	29.8	31.7	31.9	18.5		13.0	15.7	13.0	6.4	
2 or 3	33.1	26.6	33.2	41.8		22.0	20.5	22.0	25.7	
4 or more	17.8	16.8	14.9	30.8		40.9	39.0	39.4	55.1	
Missing	7.3	11.9	6.0	6.0	30.02	9.8	12.8	8.6	9.7	13.03
					0.000					0.000

	Female					Male				
	All	No test	HIV-	HIV+		All	No test	HIV-	HIV+	
Any casual partner in past 12 months										
No	69.1	68.7	68.8	70.6		77.2	77.8	76.5	80.0	
Yes	1.2	0.9	1.2	1.4		4.3	3.8	4.8	2.4	
Missing	29.8	30.4	30.0	28.0	0.52	18.5	18.4	18.7	17.6	1.62
					0.692					0.168
Less than 'almost always' condom use with any partner in past 12 months										
No	28.9	28.4	27.6	34.7		36.4	33.7	37.1	38.3	
Yes	41.1	41.0	42.0	37.5		44.5	46.6	43.8	43.7	
Missing	30.0	30.6	30.4	27.8	3.76	19.1	19.8	19.1	18.0	1.12
					0.006					0.344
Male circumcision										
No						50.7	48.9	50.8	54.8	
Yes, non-medical						27.7	26.1	28.0	29.4	
Yes, medical						18.8	20.6	18.8	14.0	
Missing						2.8	4.3	2.4	1.9	2.61
										0.021
Perceived risk of future HIV infection										
Definitely not	5.5	3.1	2.4	21.1		3.6	2.7	1.8	16.9	
Probably not	18.9	13.4	18.1	29.4		17.9	14.7	17.5	28.6	
Probably will	34.7	32.4	36.6	30.3		37.6	38.3	37.6	35.9	
Definitely will	38.8	48.3	41.4	15.5		38.8	40.6	41.8	14.8	
Missing	2.1	2.9	1.4	3.6	76.00	2.1	3.6	1.3	3.8	35.96
					0.000					0.000
Most recent HIV test										
≤ one year ago	47.5	40.9	47.2	57.9		37.4	37.7	36.6	42.0	
1-2 years ago	10.4	11.2	9.6	12.5		10.1	10.6	9.7	10.8	
2-3 years ago	4.6	4.7	4.1	6.4		4.8	5.1	4.1	8.0	
≥ 3 years ago	7.8	9.2	6.7	10.2		5.7	7.0	4.6	9.6	
Never tested	28.0	31.1	30.9	12.2		40.4	36.4	43.8	28.4	
Missing	1.6	2.8	1.4	0.9	16.75	1.7	3.2	1.2	1.1	6.92
					0.000					0.000
Received most recent HIV test result										
No	2.6	2.4	2.3	3.8		2.5	1.7	2.4	4.9	
Yes	66.6	62.6	64.2	81.3		54.1	57.0	51.6	63.7	
Missing	30.9	34.9	33.5	14.9	28.65	43.4	41.3	46.0	31.4	10.10
					0.000					0.000

Notes: Final analytic sample was restricted to individual ≥15 years old who consented to an individual interview. Raw sample size was 15,144 females and 11,564 males, representing 36,699,134 individuals based on weights produced by HSRC.^[2] Values sum to 100% within each column, for each variable.

Test statistics for each variable are for differences in proportions across categories of interview participants within gender strata, using a design-based Rao-Scott-Pearson χ^2 test with $(k, N - k)$ degrees of freedom, where k is the number of categorical values present for the variable, including 'missing'.

Supplementary Table 4: Comparisons from the model selection process

	Model AIC	Goodman-Kruskal Gamma	Theta
Male, aged 15 and over			
Normal copula			
No smoothers	14759.6	-0.088	-0.04 (-0.35,0.25)
Spatial smoothers only	14750.3	-0.468	-0.29 (-0.56,0.07)
Spatial and non-spatial smoothers	14684.6	-0.518	-0.35 (-0.63,0.00)
Frank copula			
No smoothers	14759.5	-0.081	-0.33 (-3.25,1.67)
Spatial smoothers only	14751.2	-0.370	-1.89 (-4.12,0.52)
Spatial and non-spatial smoothers	14684.6	-0.400	-1.98 (-4.99,0.83)
Female, aged 15 and over			
Normal copula			
No smoothers	19695.1	0.076	0.03 (-0.22,0.37)
Spatial smoothers only	19683.9	-0.216	-0.16 (-0.45,0.17)
Spatial and non-spatial smoothers	19616.9	-0.260	-0.17 (-0.47,0.15)
Frank copula			
No smoothers	19695.1	0.020	0.08 (-1.54,1.98)
Spatial smoothers only [†]	-	-	-
Spatial and non-spatial smoothers	19613.2	-0.180	-1.30 (-4.53,2.20)

CI: Confidence interval. [†] This model did not converge. Weights were adjustments for non-random sampling and for individuals in the initial sample who were either not contacted or declined to interview. Unweighted sample sizes: Males, >15: 11,564; Females, >15: 15,144. Smoothed non-spatial covariates were age, education in years and wealth index. Spatial smoothing was applied at the provincial level. Non-smoothed covariates for all models are listed below).

Supplementary Table 5: Multivariable bivariate Selection models: full results

	Male		Female	
	Selection model	Outcome model	Selection model	Outcome model
Race				
African	1.00	1.00	1.00	1.00
White	-0.28 [-0.48, -0.08]	-1.22 [-1.78, -0.67]	-0.35 [-0.53, -0.17]	-1.34 [-1.81, -0.86]
Coloured	0.17 [-0.02, 0.36]	-0.47 [-0.77, -0.17]	0.01 [-0.16, 0.18]	-0.62 [-0.84, -0.39]
Indian/Asian	-0.12 [-0.33, 0.09]	-0.77 [-1.17, -0.38]	-0.20 [-0.38, -0.02]	-1.00 [-1.30, -0.71]
Language				
Afrikaans	1.00	1.00	1.00	1.00
English	-0.18 [-0.30, -0.05]	0.01 [-0.29, 0.31]	-0.24 [-0.35, -0.13]	0.12 [-0.11, 0.34]
IsiNdebele	-0.12 [-0.47, 0.23]	0.03 [-0.44, 0.50]	-0.02 [-0.35, 0.31]	-0.20 [-0.57, 0.18]
SiSwati	-0.32 [-0.64, -0.01]	0.56 [0.14, 0.98]	-0.40 [-0.69, -0.11]	0.31 [-0.02, 0.64]
IsiXhosa	0.00 [-0.22, 0.22]	0.10 [-0.22, 0.42]	-0.16 [-0.36, 0.04]	0.13 [-0.11, 0.37]
IsiZulu	-0.08 [-0.30, 0.13]	0.22 [-0.09, 0.53]	-0.31 [-0.50, -0.11]	0.21 [-0.04, 0.45]
Sesotho	0.12 [-0.11, 0.35]	0.20 [-0.12, 0.52]	-0.33 [-0.53, -0.13]	0.12 [-0.13, 0.37]
Sepedi	-0.06 [-0.30, 0.18]	-0.04 [-0.39, 0.32]	-0.37 [-0.59, -0.15]	-0.18 [-0.46, 0.09]
Setswana	0.01 [-0.21, 0.23]	0.00 [-0.32, 0.33]	-0.24 [-0.45, -0.04]	-0.07 [-0.32, 0.19]
Tshivenda	-0.16 [-0.52, 0.19]	-0.28 [-0.84, 0.28]	-0.46 [-0.82, -0.11]	-0.26 [-0.65, 0.13]
Xitsonga	-0.06 [-0.33, 0.20]	0.02 [-0.36, 0.40]	-0.47 [-0.72, -0.22]	0.02 [-0.28, 0.32]
Other	-0.07 [-0.36, 0.22]	0.01 [-0.47, 0.48]	-0.31 [-0.63, 0.01]	0.07 [-0.42, 0.56]
Missing	-0.15 [-0.48, 0.17]	0.14 [-0.42, 0.70]	-0.47 [-0.73, -0.21]	0.00 [-0.41, 0.41]
Marital status				
Single	1.00	1.00	1.00	1.00
Married/civil union	-0.10 [-0.21, 0.01]	-0.13 [-0.30, 0.04]	0.03 [-0.08, 0.14]	-0.37 [-0.51, -0.23]
Going steady/living together	-0.02 [-0.12, 0.07]	0.14 [-0.01, 0.28]	0.13 [0.03, 0.23]	0.05 [-0.07, 0.18]
Widowed	-0.07 [-0.27, 0.12]	0.55 [0.29, 0.82]	0.08 [-0.04, 0.20]	-0.01 [-0.16, 0.14]
Divorced	0.09 [-0.11, 0.28]	-0.15 [-0.46, 0.16]	0.09 [-0.06, 0.24]	-0.14 [-0.33, 0.05]
Other/Missing	0.02 [-0.18, 0.23]	-0.04 [-0.43, 0.34]	-0.15 [-0.34, 0.04]	0.00 [-0.28, 0.29]
Education: Missing	-0.32 [-0.47, -0.17]	0.13 [-0.18, 0.44]	-0.42 [-0.55, -0.28]	-0.03 [-0.29, 0.24]
Wealth index: Missing	-0.13 [-0.25, 0.00]	0.04 [-0.14, 0.21]	-0.23 [-0.34, -0.11]	0.09 [-0.04, 0.22]

	Male				Female			
	Selection model		Outcome model		Selection model		Outcome model	
Location type								
Urban formal	1.00		1.00		1.00		1.00	
Urban informal	0.17	[0.05, 0.28]	-0.14	[-0.29, 0.00]	0.02	[-0.09, 0.12]	0.15	[0.04, 0.25]
Rural informal	0.23	[0.12, 0.34]	-0.23	[-0.37, -0.09]	0.22	[0.12, 0.32]	0.06	[-0.04, 0.17]
Rural formal	0.35	[0.23, 0.47]	-0.06	[-0.22, 0.10]	0.20	[0.08, 0.32]	0.04	[-0.09, 0.18]
Any drug use								
No	1.00		1.00					
Yes	0.18	[0.07, 0.28]	-0.14	[-0.28, 0.00]				
Missing	-0.22	[-0.67, 0.22]	0.82	[-0.07, 1.71]				
Victim of crime in past 12 months								
No					1.00		1.00	
Yes					-0.06	[-0.16, 0.05]	-0.03	[-0.19, 0.13]
Missing					-0.35	[-0.60, -0.11]	-0.32	[-0.69, 0.06]
Partners in past 12 months								
0	1.00		1.00					
1	0.00	[-0.26, 0.26]	0.39	[-0.04, 0.82]				
> 1	-0.20	[-0.47, 0.08]	0.43	[-0.01, 0.88]				
Missing	-0.14	[-0.36, 0.07]	-0.14	[-0.53, 0.25]				
Partner forced sex in past 12 months								
No					1.00		1.00	
Yes					0.00	[-0.30, 0.30]	-0.32	[-0.64, -0.01]
Missing					0.11	[0.01, 0.21]	0.01	[-0.12, 0.14]
Lifetime number of partners								
0	1.00		1.00		1.00		1.00	
1	-0.05	[-0.34, 0.24]	-0.31	[-0.79, 0.17]	0.16	[0.02, 0.30]	0.25	[0.06, 0.45]
2 or 3	0.08	[-0.21, 0.37]	-0.20	[-0.67, 0.27]	0.33	[0.19, 0.47]	0.57	[0.37, 0.76]
4 or more	0.14	[-0.15, 0.43]	-0.21	[-0.68, 0.26]	0.34	[0.19, 0.49]	0.73	[0.52, 0.93]
Missing	-0.03	[-0.34, 0.28]	-0.03	[-0.53, 0.46]	0.05	[-0.12, 0.22]	0.32	[0.09, 0.56]
Any casual partner in past 12 months								
No	1.00		1.00		1.00		1.00	
Yes	0.08	[-0.08, 0.24]	-0.30	[-0.56, -0.03]	0.10	[-0.17, 0.36]	-0.25	[-0.54, 0.04]
Missing	0.05	[-0.21, 0.32]	0.45	[0.01, 0.89]	-0.19	[-0.45, 0.06]	0.31	[0.00, 0.62]

	Male				Female			
	Selection model		Outcome model		Selection model		Outcome model	
Less than 'almost always' condom use with any partner in past 12m								
No	1.00		1.00		1.00		1.00	
Yes	0.06	[-0.03, 0.14]	-0.37	[-0.49, -0.26]	0.15	[0.06, 0.23]	-0.43	[-0.52, -0.34]
Missing	-0.01	[-0.25, 0.23]	-0.27	[-0.71, 0.16]	0.22	[-0.04, 0.48]	-0.44	[-0.76, -0.13]
Male circumcision								
No	1.00		1.00					
Yes, non-medical	-0.15	[-0.24, -0.06]	-0.07	[-0.20, 0.06]				
Yes, medical	0.02	[-0.06, 0.10]	-0.16	[-0.30, -0.02]				
Missing	-0.24	[-0.46, -0.02]	-0.23	[-0.68, 0.21]				
Perceived risk of future HIV infection								
Definitely not	1.00		1.00		1.00		1.00	
Probably not	-0.08	[-0.26, 0.11]	-0.89	[-1.08, -0.71]	-0.19	[-0.33, -0.04]	-0.97	[-1.10, -0.84]
Probably will	-0.09	[-0.27, 0.08]	-1.10	[-1.28, -0.92]	-0.22	[-0.36, -0.08]	-1.20	[-1.32, -1.07]
Definitely will	-0.10	[-0.28, 0.08]	-1.31	[-1.50, -1.13]	-0.26	[-0.40, -0.12]	-1.34	[-1.48, -1.21]
Missing	-0.18	[-0.50, 0.15]	-0.26	[-0.69, 0.16]	-0.14	[-0.41, 0.12]	-0.43	[-0.70, -0.16]
Most recent HIV test								
< one year ago	1.00		1.00		1.00		1.00	
1-2 years ago	0.20	[-0.53, 0.93]	-1.08	[-2.41, 0.25]	0.13	[-0.08, 0.34]	0.11	[-0.14, 0.35]
2-3 years ago	0.16	[-0.55, 0.88]	-1.43	[-2.75, -0.12]	0.19	[-0.04, 0.41]	0.13	[-0.13, 0.40]
≥ 3 years ago	0.16	[-0.56, 0.88]	-1.33	[-2.64, -0.01]	0.24	[0.00, 0.48]	0.28	[0.00, 0.56]
Never tested	0.17	[-0.55, 0.88]	-1.18	[-2.50, 0.14]	0.25	[0.03, 0.48]	0.38	[0.11, 0.65]
Missing	-0.12	[-0.51, 0.27]	-1.42	[-2.45, -0.38]	-0.12	[-0.38, 0.14]	-0.42	[-0.81, -0.02]
Received most recent HIV test result								
No	1.00		1.00		1.00		1.00	
Yes	-0.08	[-0.27, 0.11]	-0.33	[-0.59, -0.08]	-0.08	[-0.25, 0.09]	-0.31	[-0.51, -0.11]
Missing	0.11	[-0.60, 0.82]	-1.56	[-2.86, -0.25]	0.09	[-0.17, 0.35]	-0.20	[-0.51, 0.10]
Age (years)	36.95	<0.001	261.49	<0.001	71.47	<0.001	406.89	<0.001
Education (years)	22.24	<0.001	5.65	0.124	49.77	<0.001	23.65	<0.001
Wealth index (years)	14.37	0.005	9.62	0.031	72.61	<0.001	14.66	<0.001
Province (smoothed)	30.13	<0.001	0.00	0.396	36.71	<0.001	3.36	0.076
Interviewer identity (random effect)	1160.53	<0.001			1506.87	<0.001		

Unweighted sample sizes: Male >15: 11,564; Female >15: 15,144. All values are point estimates and 95% confidence intervals from probit models, except for the smoothed terms in the last five rows of the table, which are Z-scores and p-values for Wald-type tests of whether the smoothed parameters are equal to zero. The smoothed parameter for Province in the model for dependence between consent to test and HIV status was significantly different from zero in both models: for males, Z-score=8.78, p-value 0.008; for females, Z-score=17.6, p-value <0.001.

Supplementary Table 6: Age-stratified and provincial HIV prevalence estimates

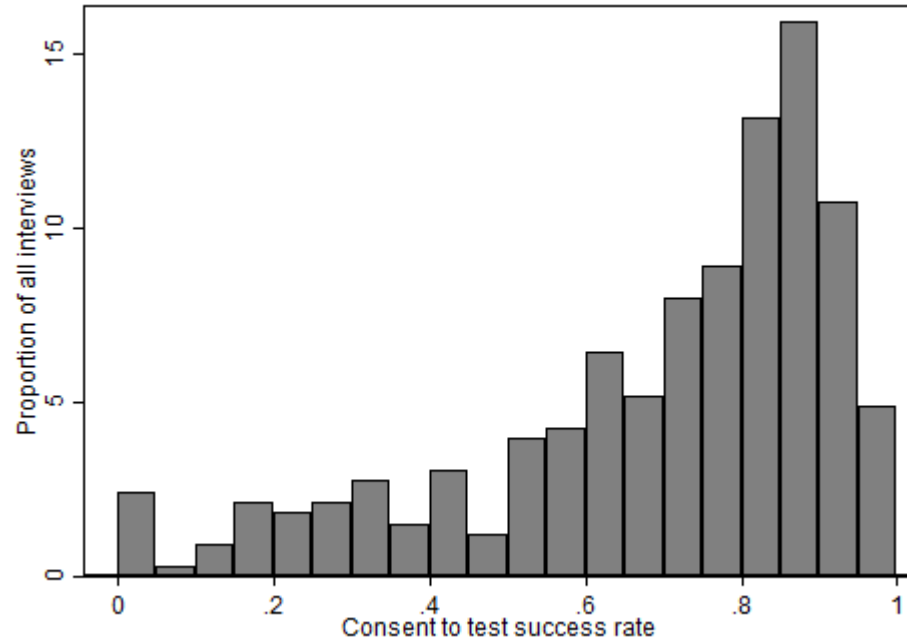
	Sample (unweighted)	HSRC 2012 report *		Weighted naïve		Weighted imputation		Weighted selection model	
		Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Male, 15 and above									
15 and above	11564			13.4	[12.6 - 14.1]	12.3	[11.8 - 13.3]	14.1	[11.3 - 17.5]
15 - 49	8485	14.5	[12.8 - 16.3]	14.5	[13.6 - 15.3]	13.2	[12.5 - 14.3]	15.1	[12.1 - 18.6]
15 - 19	1843	0.7	[0.4 - 1.2]	0.8	[0.4 - 1.3]	1.6	[1.2 - 2.4]	1.8	[1.1 - 2.7]
20 - 24	1636	5.1	[3.7 - 7.0]	5.8	[4.5 - 7.1]	6.3	[5.8 - 7.4]	7.3	[5.4 - 10.0]
25 - 29	1332	17.3	[13.8 - 21.6]	17.9	[15.6 - 20.3]	13.8	[12.8 - 15.6]	16.2	[12.3 - 20.5]
30 - 34	1018	25.6	[19.8 - 32.4]	24.3	[21.2 - 27.3]	22.4	[20.9 - 24.6]	25.9	[20.4 - 30.9]
35 - 39	960	28.8	[22.7 - 35.7]	29.6	[26.3 - 33.0]	23.1	[21.2 - 25.1]	26.0	[21.3 - 31.1]
40 - 44	923	15.8	[11.8 - 20.8]	17.3	[14.4 - 20.1]	16.7	[15.4 - 19.1]	19.2	[15.3 - 23.7]
45 - 49	773	13.4	[9.3 - 18.8]	15.2	[12.2 - 18.2]	14.4	[13.3 - 16.5]	16.3	[12.9 - 20.4]
50 - 54	775	15.5	[10.8 - 21.7]	15.8	[12.8 - 18.7]	13.5	[12.3 - 15.4]	15.4	[11.9 - 19.6]
55 - 59	695	5.5	[3.6 - 8.4]	6.8	[4.6 - 9.0]	9.7	[8.7 - 11.4]	11.2	[8.8 - 14.7]
60 and above	1609	4.6	[2.8 - 7.4]	4.7	[3.5 - 5.9]	4.6	[3.7 - 5.7]	5.2	[4.2 - 7.2]
Female, 15 and above									
15 and above	15144			20.3	[19.6 - 21.0]	18.8	[18.2 - 19.5]	19.6	[18.3 - 21.9]
15 - 49	10420	23.2	[21.3 - 25.1]	24.2	[23.3 - 25.1]	22.3	[21.7 - 23.3]	23.3	[21.7 - 25.8]
15 - 19	1908	5.6	[4.2 - 7.5]	5.6	[4.5 - 6.7]	5.5	[4.7 - 6.5]	5.9	[4.7 - 7.6]
20 - 24	1815	17.4	[14.6 - 20.6]	17.5	[15.5 - 19.4]	15.8	[14.7 - 17.2]	16.7	[14.8 - 19.4]
25 - 29	1608	28.4	[23.8 - 33.3]	30.5	[28.0 - 33.1]	29.7	[28.2 - 31.5]	30.8	[28.4 - 33.8]
30 - 34	1349	36	[30.9 - 41.4]	38.7	[35.7 - 41.6]	33.5	[31.7 - 35.3]	34.8	[32.5 - 37.6]
35 - 39	1330	31.6	[26.9 - 36.8]	35.7	[32.8 - 38.7]	33.5	[31.9 - 35.1]	34.9	[32.6 - 38.2]
40 - 44	1197	28	[22.8 - 33.9]	28.1	[25.3 - 31.0]	23.7	[22.2 - 25.4]	24.9	[22.8 - 28.2]
45 - 49	1213	19.7	[15.6 - 24.5]	21.0	[18.4 - 23.6]	18.3	[17.2 - 19.9]	19.3	[17.2 - 21.6]
50 - 54	1150	14.8	[11.4 - 19.0]	14.7	[12.4 - 17.0]	14.0	[12.6 - 15.8]	14.8	[13.3 - 17.0]
55 - 59	1038	9.7	[7.0 - 13.3]	11.2	[9.0 - 13.3]	9.9	[9.0 - 11.4]	10.5	[9.1 - 12.4]
60 and above	2536	2.4	[1.7 - 3.3]	2.9	[2.2 - 3.7]	3.6	[3.0 - 4.5]	3.9	[3.2 - 5.3]

	Sample (unweighted)	Weighted naïve		Weighted imputation		Weighted selection model	
		Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Male, 15 and above							
Western Cape	1428	5.7	[4.4 - 7.1]	5.9	[5.0 - 7.2]	7.6	[5.8 - 10.3]
Eastern Cape	1453	13.7	[11.7 - 15.6]	12.8	[11.2 - 14.9]	15.3	[12.3 - 18.7]
Northern Cape	929	12.0	[9.7 - 14.3]	10.1	[8.9 - 11.8]	12.1	[9.9 - 15.6]
Free State	897	16.4	[13.6 - 19.3]	15.2	[13.2 - 17.4]	17.9	[14.0 - 22.1]
KwaZulu-Natal	2600	19.0	[17.3 - 20.7]	17.8	[15.8 - 19.6]	18.1	[15.3 - 20.9]
North-West	806	12.0	[9.4 - 14.6]	11.7	[10.0 - 14.0]	14.7	[11.7 - 18.5]
Gauteng	1589	14.4	[12.1 - 16.6]	11.8	[10.5 - 13.7]	13.9	[10.1 - 18.5]
Mpumalanga	887	14.4	[11.8 - 17.0]	14.9	[13.5 - 17.0]	16.3	[13.2 - 20.7]
Limpopo	975	7.8	[5.8 - 9.7]	8.3	[7.1 - 10.0]	9.9	[7.3 - 13.6]
Female, 15 and above							
Western Cape	1853	7.1	[5.8 - 8.4]	7.8	[6.9 - 8.7]	10.0	[8.9 - 11.8]
Eastern Cape	1901	21.2	[19.2 - 23.2]	20.8	[19.3 - 22.7]	23.4	[20.9 - 25.4]
Northern Cape	1128	10.7	[8.8 - 12.7]	9.3	[8.2 - 10.8]	10.9	[9.7 - 12.6]
Free State	1094	23.9	[21.0 - 26.8]	20.3	[18.7 - 22.1]	21.7	[19.1 - 24.6]
KwaZulu-Natal	3634	29.7	[28.0 - 31.3]	27.3	[25.8 - 29.0]	26.7	[24.4 - 29.0]
North-West	1035	22.3	[19.4 - 25.2]	20.6	[18.3 - 22.5]	22.5	[19.9 - 25.9]
Gauteng	2089	18.1	[16.0 - 20.2]	15.8	[14.6 - 17.9]	16.9	[15.1 - 19.9]
Mpumalanga	1048	24.9	[22.0 - 27.8]	24.8	[22.6 - 27.4]	24.0	[21.8 - 26.9]
Limpopo	1362	16.1	[13.9 - 18.3]	16.8	[15.2 - 18.9]	16.5	[14.4 - 20.2]

CI: Confidence interval. Weights were adjustments for non-random sampling and for individuals in the initial sample who were either not contacted or declined to interview. “Naïve” estimates ignore missing HIV outcomes; “Imputation” estimates are based on a model of missing values; “Selection” estimates are based on a joint model of missingness and HIV status.

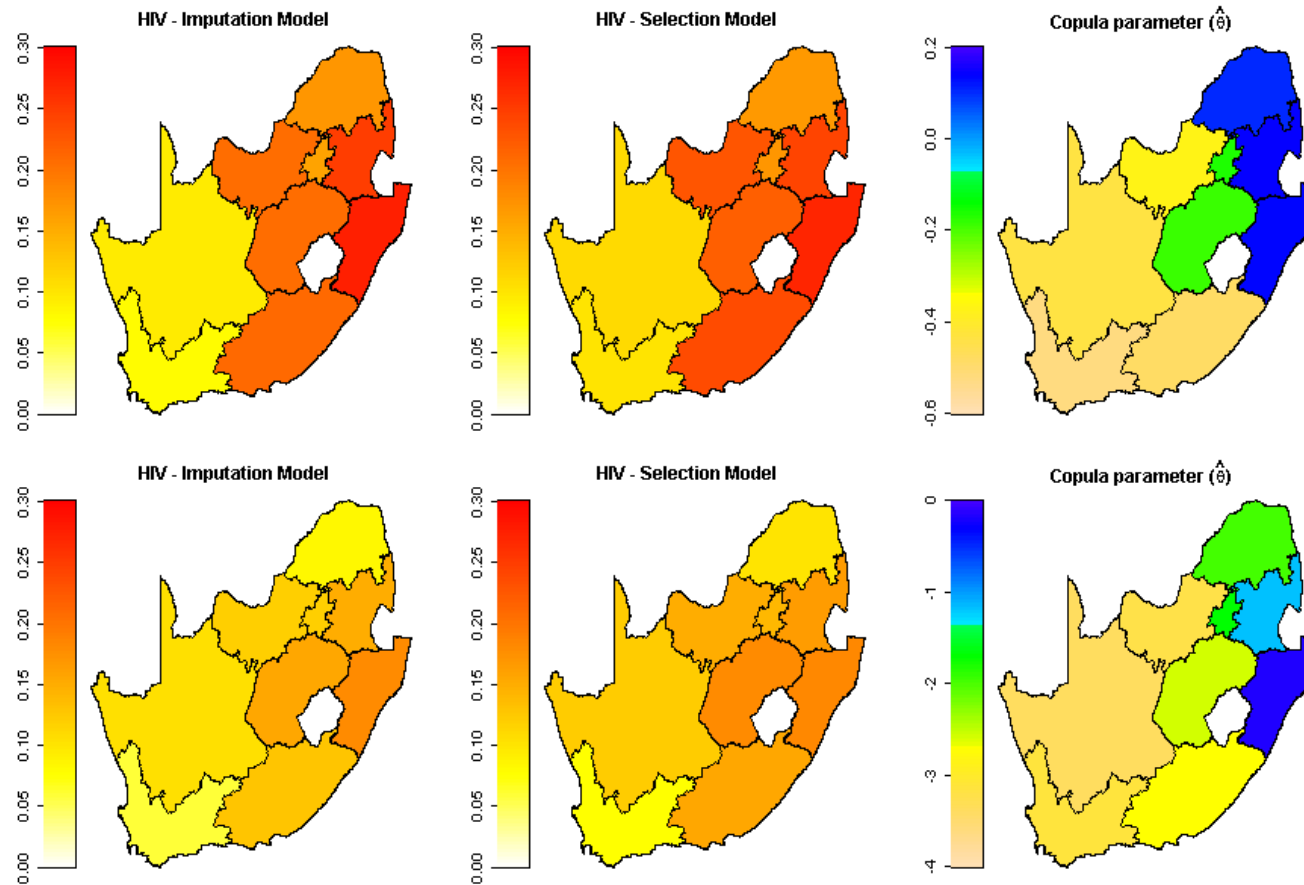
* The HSRC 2012 report figures are most closely comparable to the “Weighted, naïve” estimates, but are not directly comparable (due to slight differences in sample size due to ability to match interviewers to interviewees).

Supplementary Figure 1: Success rate of interviewers (n=327) in obtaining HIV test consent during individual interviews in 2012 South African National HIV Prevalence, Incidence and Behaviour Survey



Mean number of interviewees per interviewer: 117; interquartile range: 32-174; range 1-586.

Supplementary Figure 2: Spatial variability in estimated correlation between errors in willingness to consent to HIV test and HIV seropositivity in 2012 South African National HIV Prevalence, Incidence and Behaviour Survey



Top row: males aged 15 and over; bottom row: females aged 15 and over. Copulae values for males (Normal) and female (Frank) are not directly comparable. A negative value of the copula parameter indicates that those who decline to test are more likely to be HIV positive. Numeric values for these maps are provided in Supplementary Table 6.