

*6th International Workshop on HIV & Women
Boston 2016*

Gender, socio-economic status, and HIV-treatment outcomes

Fiona Lampe

**Research Department of Infection and Population Health,
University College London**



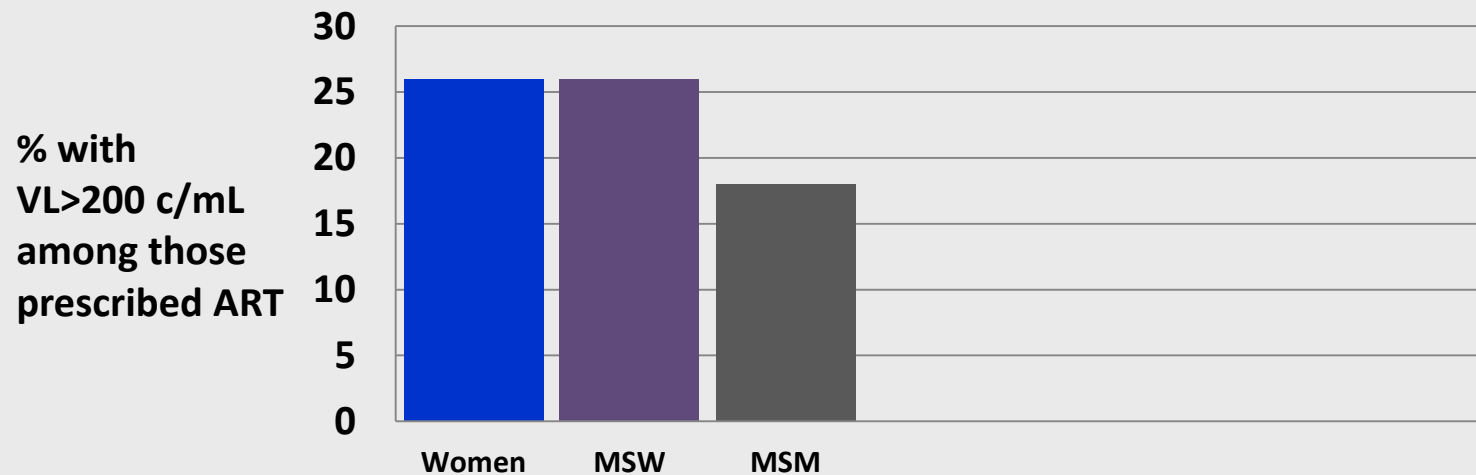
Background

- Studies from high income countries inconsistent regarding virological outcomes of ART in women versus men,^{1,2} but evidence of poorer VL outcomes for women and heterosexual men (MSW), compared to MSM³⁻¹¹

¹Castiho 2014; ²Soon 2012; ³Fardet 2006; ⁴Lampe 2006; ⁵Keiser 2012; ⁶Hall 2013; ⁷Helleberg 2013; ⁸Cohen 2014 ⁹Saunders 2015; ¹⁰Robertson 2015; ¹¹Burch 2015

Background

- Studies from high income countries inconsistent regarding virological outcomes of ART in women versus men,^{1,2} but evidence of poorer VL outcomes for women and heterosexual men (MSW), compared to MSM³⁻¹¹

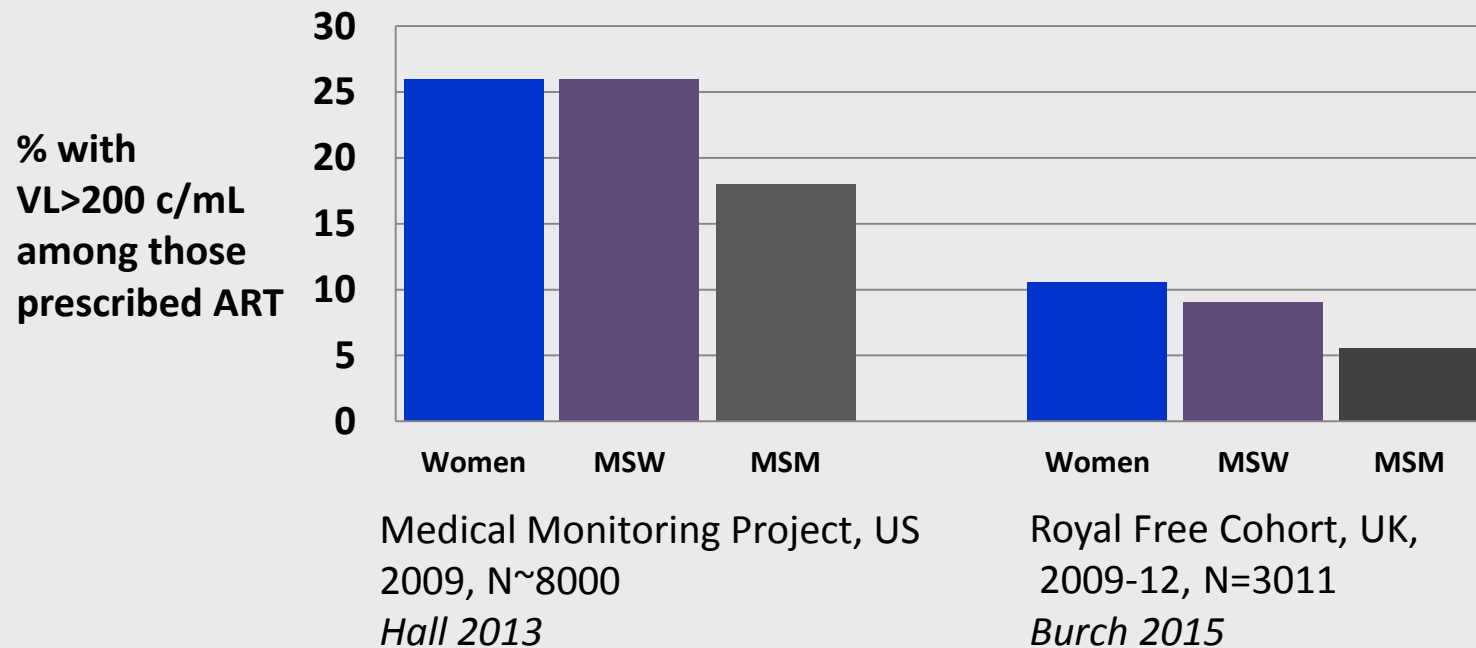


Medical Monitoring Project, US
2009, N~8000
Hall 2013

¹Castiho 2014; ²Soon 2012; ³Fardet 2006; ⁴Lampe 2006; ⁵Keiser 2012; ⁶Hall 2013; ⁷Helleberg 2013; ⁸Cohen 2014 ⁹Saunders 2015; ¹⁰Robertson 2015; ¹¹Burch 2015

Background

- Studies from high income countries inconsistent regarding virological outcomes of ART in women versus men,^{1,2} but evidence of poorer VL outcomes for women and heterosexual men (MSW), compared to MSM³⁻¹¹



¹Castiho 2014; ²Soon 2012; ³Fardet 2006; ⁴Lampe 2006; ⁵Keiser 2012; ⁶Hall 2013; ⁷Helleberg 2013; ⁸Cohen 2014 ⁹Saunders 2015; ¹⁰Robertson 2015; ¹¹Burch 2015

Background

- Socio-economic factors (e.g. poverty, housing, social support) may be particularly relevant among women with HIV
- Socio-economic disadvantage may be linked to depression and difficulties with ART adherence
- Socio-economic inequalities exist in prognosis of chronic diseases in high income countries¹⁻⁴ (e.g. cancer, diabetes, CVD)
- Little research on socio-economic status (SES) and virological outcomes of ART from settings with universal free health care

¹Woods 2006; ²Manderbacka 2006; ³Hawkins 2012; ⁴Vona-Davis 2009

Aim

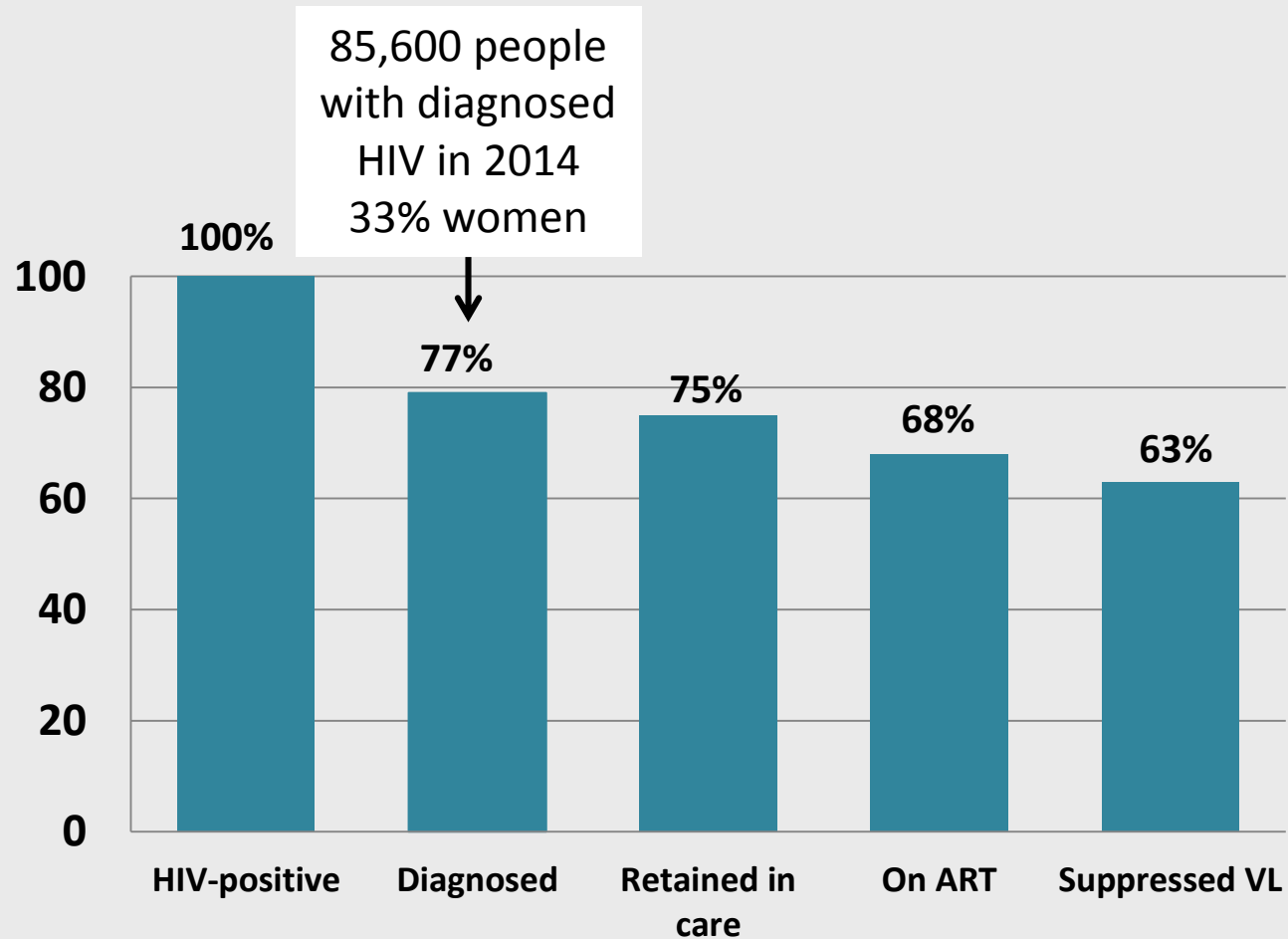
- Assess effects of gender and socio-economic status on virological outcomes of ART in the UK, using data from the ASTRA study - multicentre questionnaire study of people living with HIV in the UK in 2011/12
- Results in context

Questions

Among people with HIV in the UK:

1. How do socio-economic characteristics, ART non-adherence, and VL non-suppression on ART, differ between women MSM, and MSW?
2. Are socio-economic factors & depression associated with ART non-adherence and VL non-suppression among women? (cross-sectional)
3. Are the associations similar among MSM, MSW?
4. Are socio-economic factors & depression predictive of VL rebound? (longitudinal)
5. How much do socio-economic factors & depression 'explain' gender variation in ART non-adherence, VL non-suppression, and VL rebound?

HIV in the UK



HIV in the UK, continuum of care
Public Health England, 2013

ASTRA study

- ASTRA (Antiretrovirals, Sexual Transmission Risk and Attitudes) questionnaire study of HIV-outpatients from 8 UK centres in 2011/12
- N=3258 (64% response rate)
637 women
373 MSW (heterosexual men)
2248 MSM (gay/bisexual men)
- Self-completed, confidential questionnaire: demographic, socio-economic, lifestyle, health, HIV and ART-related factors
- Clinic VL and CD4 (latest at questionnaire) recorded
- Linkage with additional clinic data for consenting participants (N=2983 (92%) consented; data available for 6 clinics, N=2575)

Questionnaire-assessed factors (ASTRA)

- *Demographic factors* [gender/sexuality, age, ethnicity, stable partner, children, identifies with a religion]
- *Socio-economic factors* [UK birth/English fluency, financial hardship, employment, housing status, education, supportive network (modified Duke FSS questionnaire)]
- *Current depression symptoms* (PHQ-9)
- *HIV-related and other health-related factors* [time since HIV diagnosis, ART use, disclosure of HIV status, currently pregnant, IDU transmission route]
- *Lifestyle factors* [smoking, possible alcohol dependency (CAGE questionnaire), recreational drug use]

Questions

Among people with HIV in the UK:

1. How do socio-economic characteristics, ART non-adherence, and VL non-suppression on ART, differ between women MSM, and MSW?
2. Are socio-economic factors & depression associated with ART non-adherence and VL non-suppression among women? (cross-sectional)
3. Are the associations similar among MSM, MSW?
4. Are socio-economic factors & depression predictive of VL rebound? (longitudinal)
5. How much do socio-economic factors & depression 'explain' gender variation in ART non-adherence, VL non-suppression, and VL rebound?

Demographic, HIV & lifestyle factors by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
Age<40 years	38%	20%	28%
White	19%	32%	88%
Black African	64%	49%	1%
Other/missing	17%	19%	11%
Current partner	55%	68%	54%
Children	75%	69%	7%
Currently pregnant	2%		
Identifies with a religion	89%	79%	43%
Not disclosed HIV-status	16%	17%	5%
Current smoker	11%	32%	37%
Possible alcohol dependency[§]	11%	19%	20%
Recreational drugs past 3m	7%	17%	51%
IDU likely transmission risk	3%	6%	1%

p<0.001 for comparison across gender/sexuality groups, all factors

§CAGE questionnaire, score ≥2

Demographic, HIV & lifestyle factors by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
Age<40 years	38%	20%	28%
White	19%	32%	88%
Black African	64%	49%	1%
Other/missing	17%	19%	11%
Current partner	55%	68%	54%
Children	75%	69%	7%
Currently pregnant	2%		
Identifies with a religion	89%	79%	43%
Not disclosed HIV-status	16%	17%	5%
Current smoker	11%	32%	37%
Possible alcohol dependency[§]	11%	19%	20%
Recreational drugs past 3m	7%	17%	51%
IDU likely transmission risk	3%	6%	1%

p<0.001 for comparison across gender/sexuality groups, all factors

§CAGE questionnaire, score ≥2

Demographic, HIV & lifestyle factors by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
Age<40 years	38%	20%	28%
White	19%	32%	88%
Black African	64%	49%	1%
Other/missing	17%	19%	11%
Current partner	55%	68%	54%
Children	75%	69%	7%
Currently pregnant	2%		
Identifies with a religion	89%	79%	43%
Not disclosed HIV-status	16%	17%	5%
Current smoker	11%	32%	37%
Possible alcohol dependency [§]	11%	19%	20%
Recreational drugs past 3m	7%	17%	51%
IDU likely transmission risk	3%	6%	1%

p<0.001 for comparison across gender/sexuality groups, all factors

§CAGE questionnaire, score ≥2

Demographic, HIV & lifestyle factors by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
Age<40 years	38%	20%	28%
White	19%	32%	88%
Black African	64%	49%	1%
Other/missing	17%	19%	11%
Current partner	55%	68%	54%
Children	75%	69%	7%
Currently pregnant	2%		
Identifies with a religion	89%	79%	43%
Not disclosed HIV-status	16%	17%	5%
Current smoker	11%	32%	37%
Possible alcohol dependency [§]	11%	19%	20%
Recreational drugs past 3m	7%	17%	51%
IDU likely transmission risk	3%	6%	1%

p<0.001 for comparison across gender/sexuality groups, all factors

§CAGE questionnaire, score ≥2

Demographic, HIV & lifestyle factors by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
Age<40 years	38%	20%	28%
White	19%	32%	88%
Black African	64%	49%	1%
Other/missing	17%	19%	11%
Current partner	55%	68%	54%
Children	75%	69%	7%
Currently pregnant	2%		
Identifies with a religion	89%	79%	43%
Not disclosed HIV-status	16%	17%	5%
Current smoker	11%	32%	37%
Possible alcohol dependency [§]	11%	19%	20%
Recreational drugs past 3m	7%	17%	51%
IDU likely transmission risk	3%	6%	1%

p<0.001 for comparison across gender/sexuality groups, all factors

§CAGE questionnaire, score ≥2

Demographic, HIV & lifestyle factors by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
Age<40 years	38%	20%	28%
White	19%	32%	88%
Black African	64%	49%	1%
Other/missing	17%	19%	11%
Current partner	55%	68%	54%
Children	75%	69%	7%
Currently pregnant	2%		
Identifies with a religion	89%	79%	43%
Not disclosed HIV-status	16%	17%	5%
Current smoker	11%	32%	37%
Possible alcohol dependency [§]	11%	19%	20%
Recreational drugs past 3m	7%	17%	51%
IDU likely transmission risk	3%	6%	1%

p<0.001 for comparison across gender/sexuality groups, all factors

§CAGE questionnaire, score ≥2

Socioeconomic factors & depression by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
UK born	19%	29%	71%
Non-UK, fluent English	63%	54%	26%
Non-UK, not fluent English	18%	18%	3%
Enough money for basic needs	22%	30%	52%
Mostly enough money	24%	22%	27%
Sometimes enough money	30%	28%	13%
Not enough money	25%	20%	8%
Employed	45%	45%	61%
Homeowner	15%	22%	41%
Renting	68%	59%	51%
Unstable housing / other~	18%	19%	8%
University education	31%	35%	44%
Lower supportive network[#]	24%	22%	22%
Depression symptoms*	30%	28%	25%

p<0.001 for comparison across gender/sexuality groups, all factors apart from supportive network (*p*>0.1) and depression symptoms (*p*=0.02)

*PHQ-9 major & other depression; [#]Modified Duke Functional Social Support Questionnaire (FSSQ) score <16; ~Temporary accommodation, staying with family or friends, homeless, other

Socioeconomic factors & depression by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
UK born	19%	29%	71%
Non-UK, fluent English	63%	54%	26%
Non-UK, not fluent English	18%	18%	3%
Enough money for basic needs	22%	30%	52%
Mostly enough money	24%	22%	27%
Sometimes enough money	30%	28%	13%
Not enough money	25%	20%	8%
Employed	45%	45%	61%
Homeowner	15%	22%	41%
Renting	68%	59%	51%
Unstable housing / other~	18%	19%	8%
University education	31%	35%	44%
Lower supportive network[#]	24%	22%	22%
Depression symptoms[*]	30%	28%	25%

p<0.001 for comparison across gender/sexuality groups, all factors apart from supportive network (*p*>0.1) and depression symptoms (*p*=0.02)

^{*}PHQ-9 major & other depression; [#]Modified Duke Functional Social Support Questionnaire (FSSQ) score <16; ~Temporary accommodation, staying with family or friends, homeless, other

Socioeconomic factors & depression by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
UK born	19%	29%	71%
Non-UK, fluent English	63%	54%	26%
Non-UK, not fluent English	18%	18%	3%
Enough money for basic needs	22%	30%	52%
Mostly enough money	24%	22%	27%
Sometimes enough money	30%	28%	13%
Not enough money	25%	20%	8%
Employed	45%	45%	61%
Homeowner	15%	22%	41%
Renting	68%	59%	51%
Unstable housing / other~	18%	19%	8%
University education	31%	35%	44%
Lower supportive network[#]	24%	22%	22%
Depression symptoms[*]	30%	28%	25%

p<0.001 for comparison across gender/sexuality groups, all factors apart from supportive network (*p*>0.1) and depression symptoms (*p*=0.02)

^{*}PHQ-9 major & other depression; [#]Modified Duke Functional Social Support Questionnaire (FSSQ) score <16; ~Temporary accommodation, staying with family or friends, homeless, other

Socioeconomic factors & depression by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
UK born	19%	29%	71%
Non-UK, fluent English	63%	54%	26%
Non-UK, not fluent English	18%	18%	3%
Enough money for basic needs	22%	30%	52%
Mostly enough money	24%	22%	27%
Sometimes enough money	30%	28%	13%
Not enough money	25%	20%	8%
Employed	45%	45%	61%
Homeowner	15%	22%	41%
Renting	68%	59%	51%
Unstable housing / other~	18%	19%	8%
University education	31%	35%	44%
Lower supportive network[#]	24%	22%	22%
Depression symptoms[*]	30%	28%	25%

p<0.001 for comparison across gender/sexuality groups, all factors apart from supportive network (*p*>0.1) and depression symptoms (*p*=0.02)

***PHQ-9 major & other depression; *#*Modified Duke Functional Social Support Questionnaire (FSSQ) score <16; *~*Temporary accommodation, staying with family or friends, homeless, other

Socioeconomic factors & depression by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
UK born	19%	29%	71%
Non-UK, fluent English	63%	54%	26%
Non-UK, not fluent English	18%	18%	3%
Enough money for basic needs	22%	30%	52%
Mostly enough money	24%	22%	27%
Sometimes enough money	30%	28%	13%
Not enough money	25%	20%	8%
Employed	45%	45%	61%
Homeowner	15%	22%	41%
Renting	68%	59%	51%
Unstable housing / other~	18%	19%	8%
University education	31%	35%	44%
Lower supportive network[#]	24%	22%	22%
Depression symptoms[*]	30%	28%	25%

p<0.001 for comparison across gender/sexuality groups, all factors apart from supportive network (*p*>0.1) and depression symptoms (*p*=0.02)

**PHQ-9 major & other depression; #Modified Duke Functional Social Support Questionnaire (FSSQ) score <16; ~Temporary accommodation, staying with family or friends, homeless, other*

Socioeconomic factors & depression by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
UK born	19%	29%	71%
Non-UK, fluent English	63%	54%	26%
Non-UK, not fluent English	18%	18%	3%
Enough money for basic needs	22%	30%	52%
Mostly enough money	24%	22%	27%
Sometimes enough money	30%	28%	13%
Not enough money	25%	20%	8%
Employed	45%	45%	61%
Homeowner	15%	22%	41%
Renting	68%	59%	51%
Unstable housing / other~	18%	19%	8%
University education	31%	35%	44%
Lower supportive network[#]	24%	22%	22%
Depression symptoms[*]	30%	28%	25%

p<0.001 for comparison across gender/sexuality groups, all factors apart from supportive network (*p*>0.1) and depression symptoms (*p*=0.02)

**PHQ-9 major & other depression; #Modified Duke Functional Social Support Questionnaire (FSSQ) score <16; ~Temporary accommodation, staying with family or friends, homeless, other*

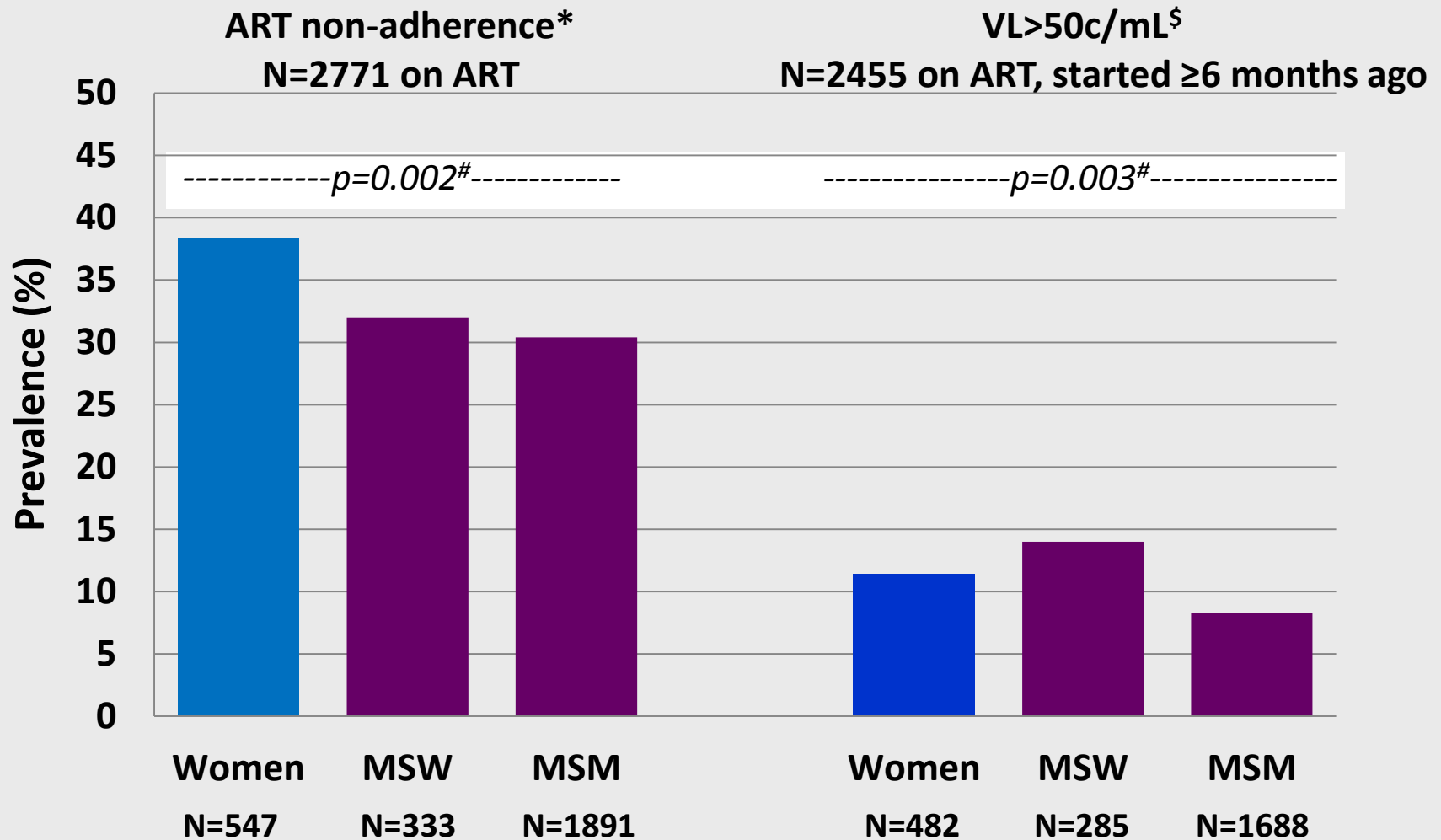
Socioeconomic factors & depression by gender/sexuality

N=3258	Women N=637	MSW N=373	MSM N=2248
UK born	19%	29%	71%
Non-UK, fluent English	63%	54%	26%
Non-UK, not fluent English	18%	18%	3%
Enough money for basic needs	22%	30%	52%
Mostly enough money	24%	22%	27%
Sometimes enough money	30%	28%	13%
Not enough money	25%	20%	8%
Employed	45%	45%	61%
Homeowner	15%	22%	41%
Renting	68%	59%	51%
Unstable housing / other~	18%	19%	8%
University education	31%	35%	44%
Lower supportive network#	24%	22%	22%
Depression symptoms*	30%	28%	25%

p<0.001 for comparison across gender/sexuality groups, all factors apart from supportive network (*p*>0.1) and depression symptoms (*p*=0.02)

*PHQ-9 major & other depression; #Modified Duke Functional Social Support Questionnaire (FSSQ) score <16; ~Temporary accommodation, staying with family or friends, homeless, other

ART non-adherence and VL>50c/mL by gender/sexuality



*Missed ≥1 ART dose in past 2 weeks, or ≥2 consecutive days of ART in past 3 months (questionnaire)

\$Using latest clinic VL at time of questionnaire

#Comparison across gender/sexuality groups, Chi-squared

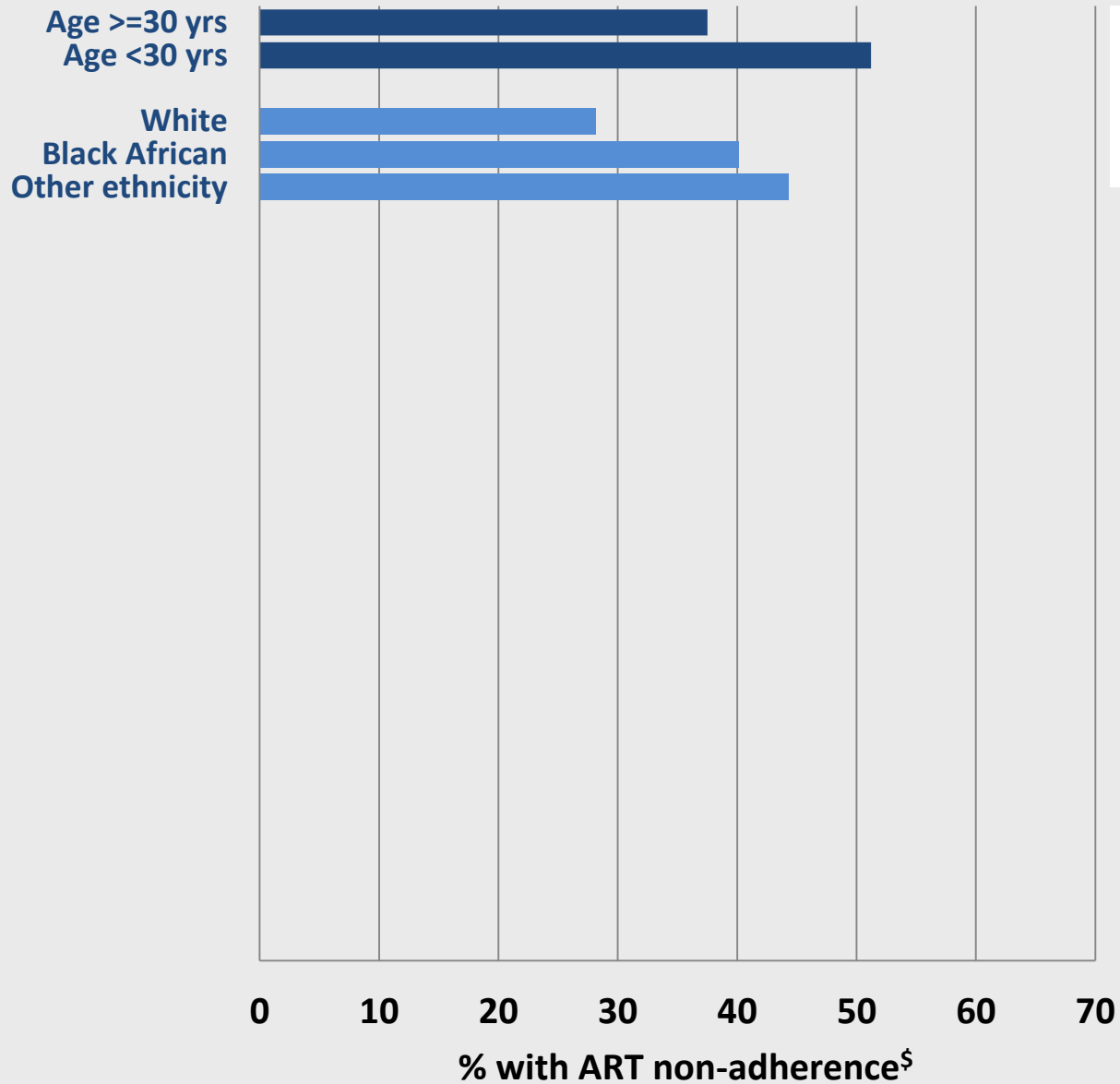
Questions

Among people with HIV in the UK:

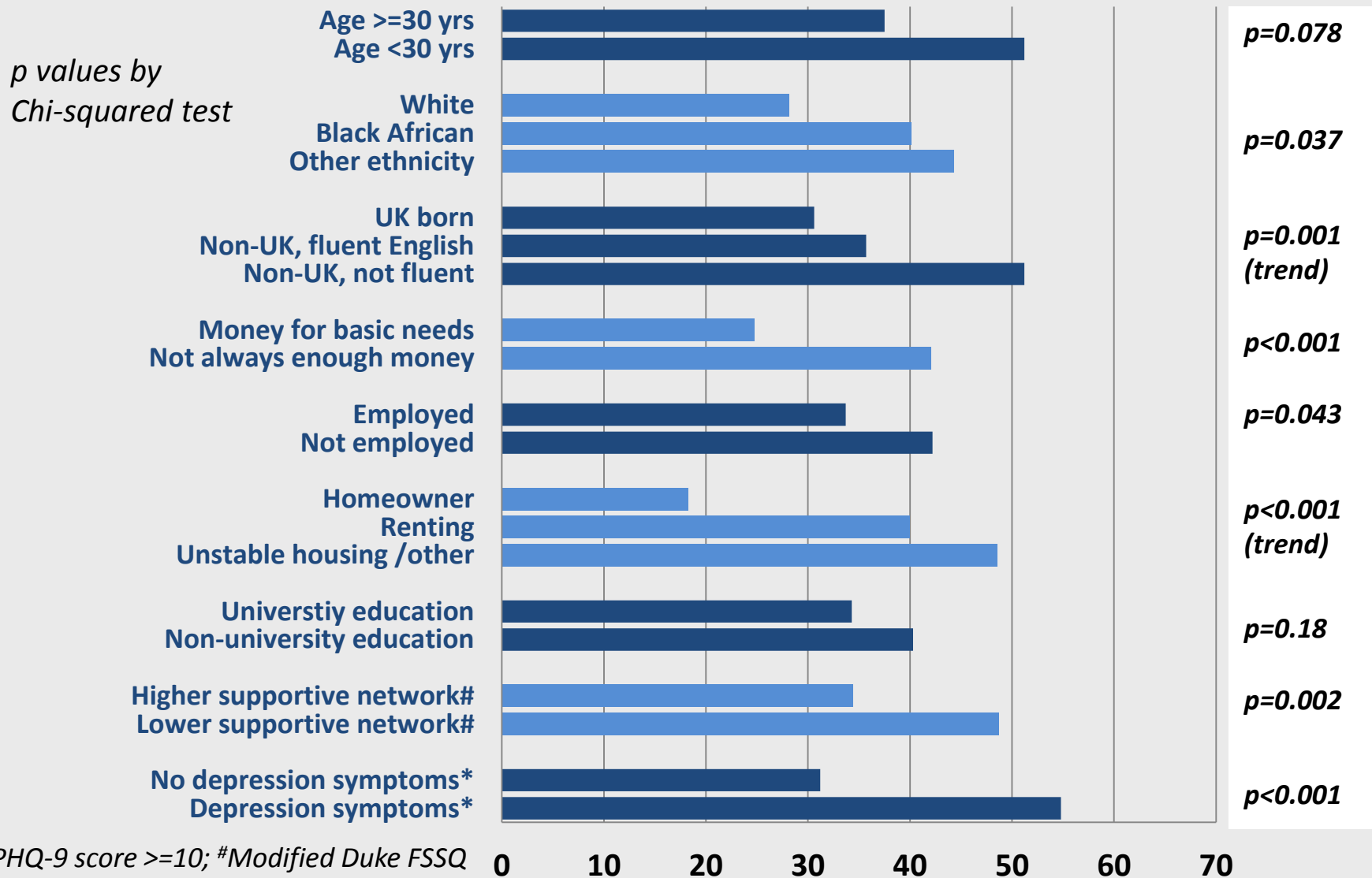
1. How do socio-economic characteristics, ART non-adherence, and VL non-suppression on ART, differ between women MSM, and MSW?
- 2. Are socio-economic factors & depression associated with ART non-adherence and VL non-suppression among women? (cross-sectional)**
3. Are the associations similar among MSM, MSW?
4. Are socio-economic factors & depression predictive of VL rebound? (longitudinal)
5. How much do socio-economic factors & depression 'explain' gender variation in ART non-adherence, VL non-suppression, and VL rebound?

ART non-adherence among 547 women on ART

*p values by
Chi-squared test*



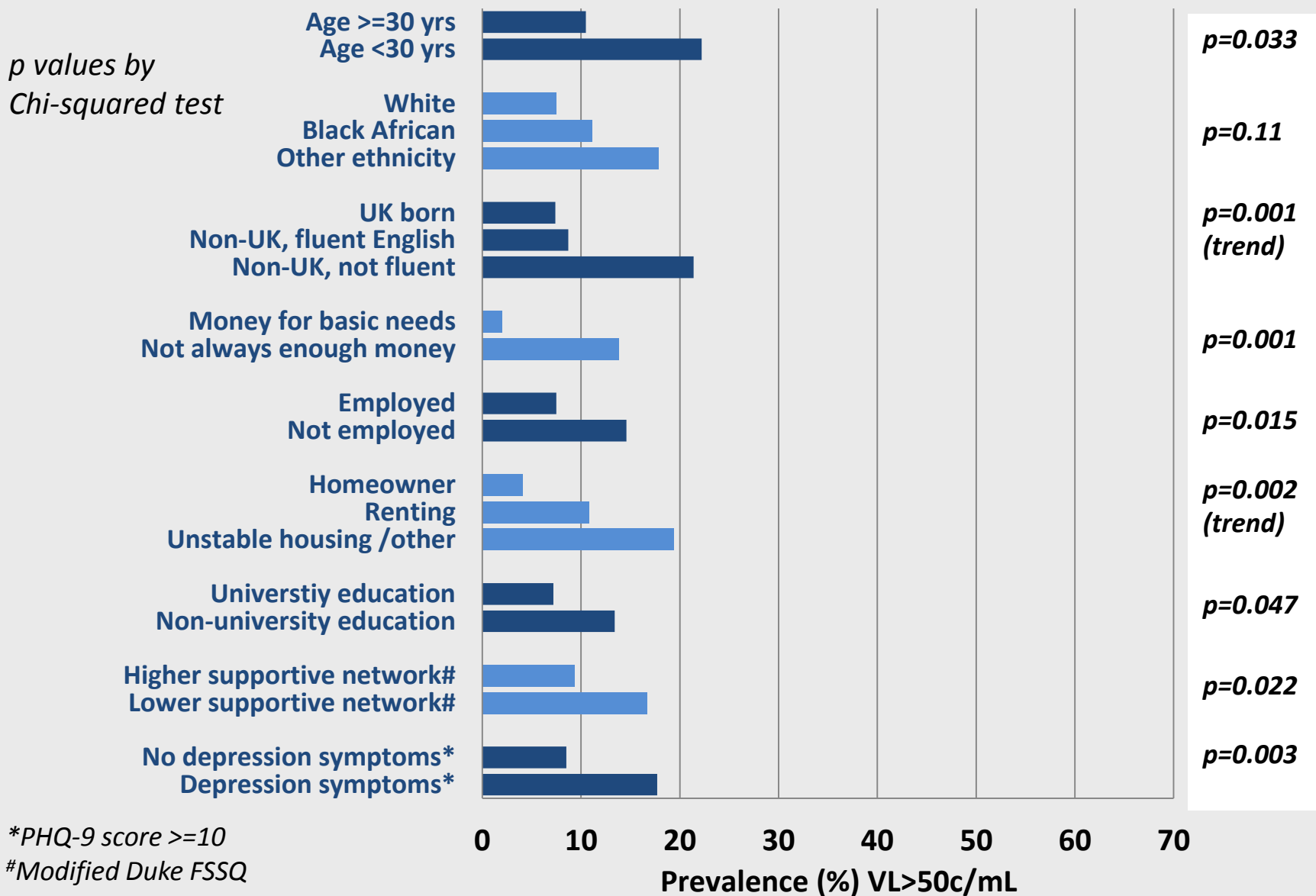
ART non-adherence among 547 women on ART



*PHQ-9 score ≥10; #Modified Duke FSSQ
 \$1 or more missed dose in past 2 weeks or
 2 consecutive days missed in past 2 months

% with ART non-adherence^{\$}

VL>50c/mL among 482 women on ART, started ≥6m ago



Socio-economic factors & depression and VL>50c/mL: partially adjusted associations among women

N=482 women on ART ≥6m~	Adjusted* prevalence ratios (95% CI)	
UK born	1	
Non-UK, good English	1.0 (0.4, 2.4)	<i>p</i> =0.010
Non-UK, difficulty English	2.6 (1.1, 6.3)	(trend)
Money for basic needs	1	
Not always enough money	6.5 (1.5, 27.7)	<i>p</i> <0.001
Employed	1	
Not employed	1.8 (1.0, 3.2)	<i>p</i> =0.035
Homeowner	1	
Renting	2.5 (0.8, 8.1)	<i>p</i> =0.014
Unstable / other	3.9 (1.1, 14.1)	(trend)
University education	1	
Non-university education	1.7 (0.9, 3.3)	<i>p</i> =0.072
Higher supportive network	1	
Lower supportive network	1.8 (1.1, 3.1)	<i>p</i> =0.044
No depression symptoms	1	
Depression symptoms	2.0 (1.2, 3.3)	<i>p</i> =0.015

***Adjusted for age, ethnicity**

Modified Poisson regression

~On ART, started ≥6 months ago

ART non-adherence and VL>50c/mL according to other factors among women on ART

- Other demographic and HIV/health-related factors, were **not significantly** associated with ART non-adherence or VL>50c/mL among women on ART ($p \geq 0.1$ for each):
 - Having a stable partner; Having children
 - Identifying with a religion
 - Time since HIV diagnosis; Time on ART; “Started because HIV making me ill”
 - Non-disclosure of HIV status
 - Current pregnancy; IDU transmission risk (small numbers)
- Lifestyle factors were **associated with ART non-adherence** ($p < 0.05$) but not with VL>50c/mL
 - Current smoking
 - Possible alcohol dependency (CAGE questionnaire)
 - Recreational drug use in past 3 months

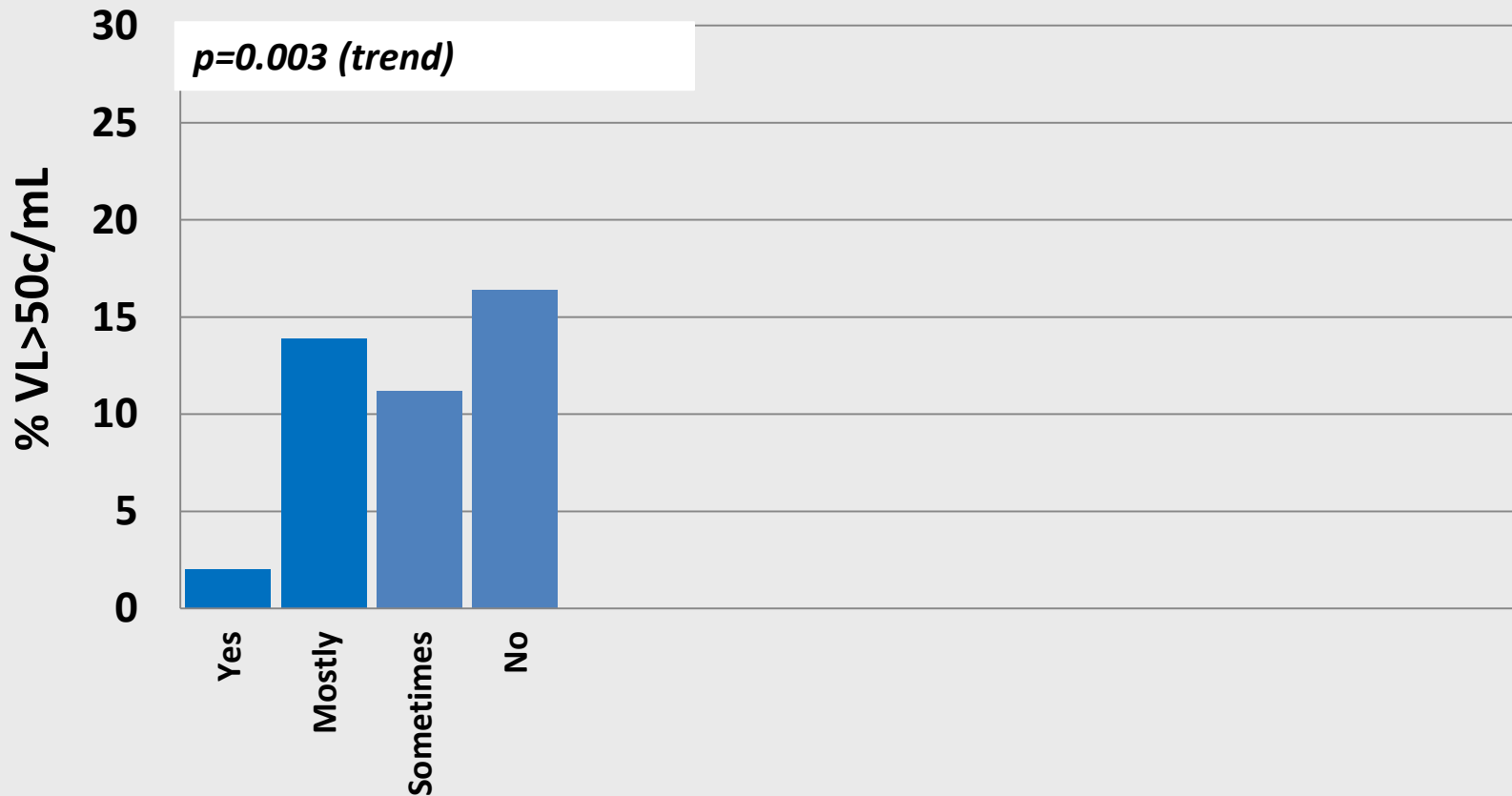
Questions

Among people with HIV in the UK:

1. How do socio-economic characteristics, ART non-adherence, and VL non-suppression on ART, differ between women MSM, and MSW?
2. Are socio-economic factors & depression associated with ART non-adherence and VL non-suppression among women? (cross-sectional)
3. **Are the associations similar among MSM, MSW?**
4. Are socio-economic factors & depression predictive of VL rebound? (longitudinal)
5. How much do socio-economic factors & depression 'explain' gender variation in ART non-adherence, VL non-suppression, and VL rebound?

VL>50c/mL by financial status among: women, MSW, MSM, on ART started ≥6 months ago

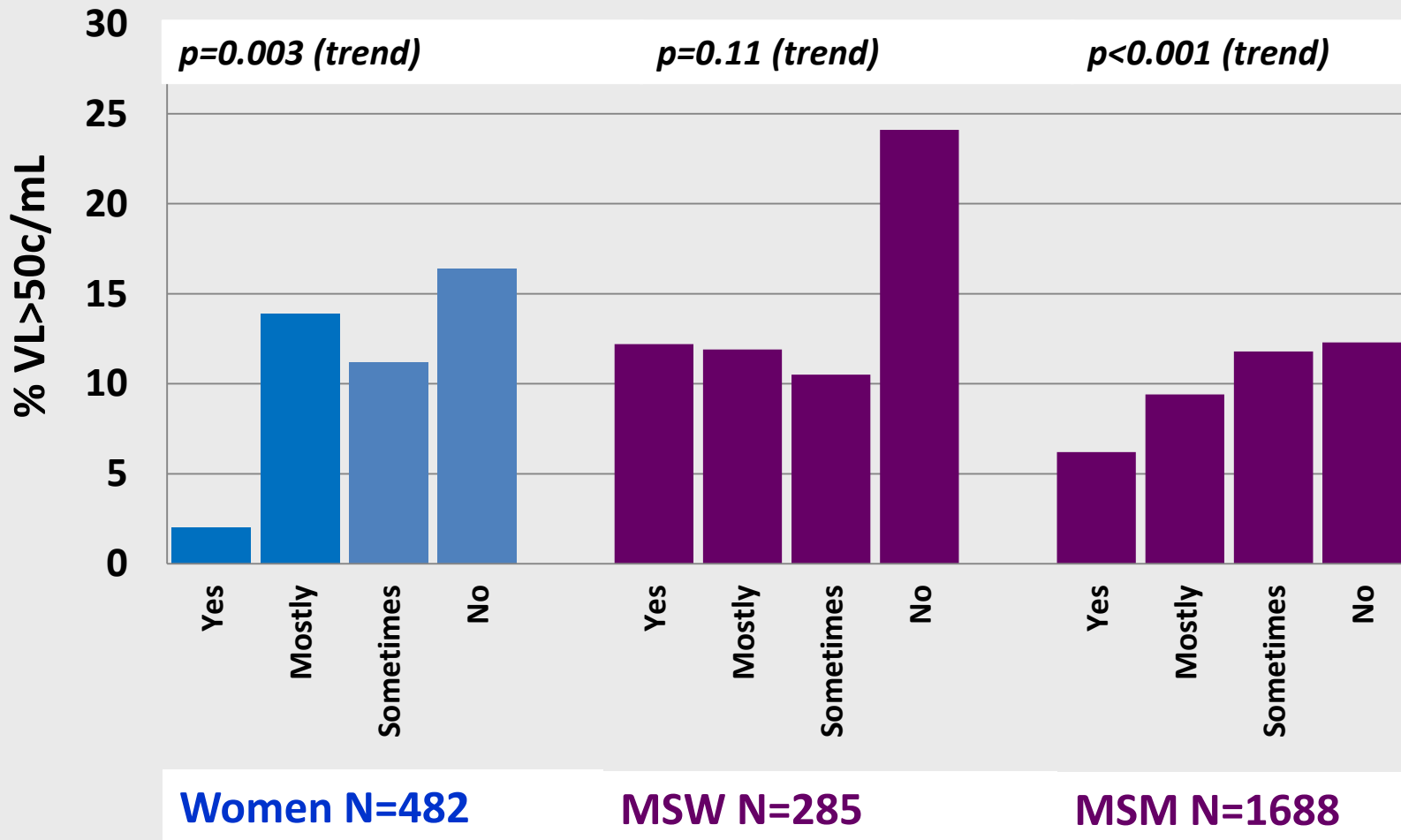
'Enough money for basic needs, e.g. food, heating?'



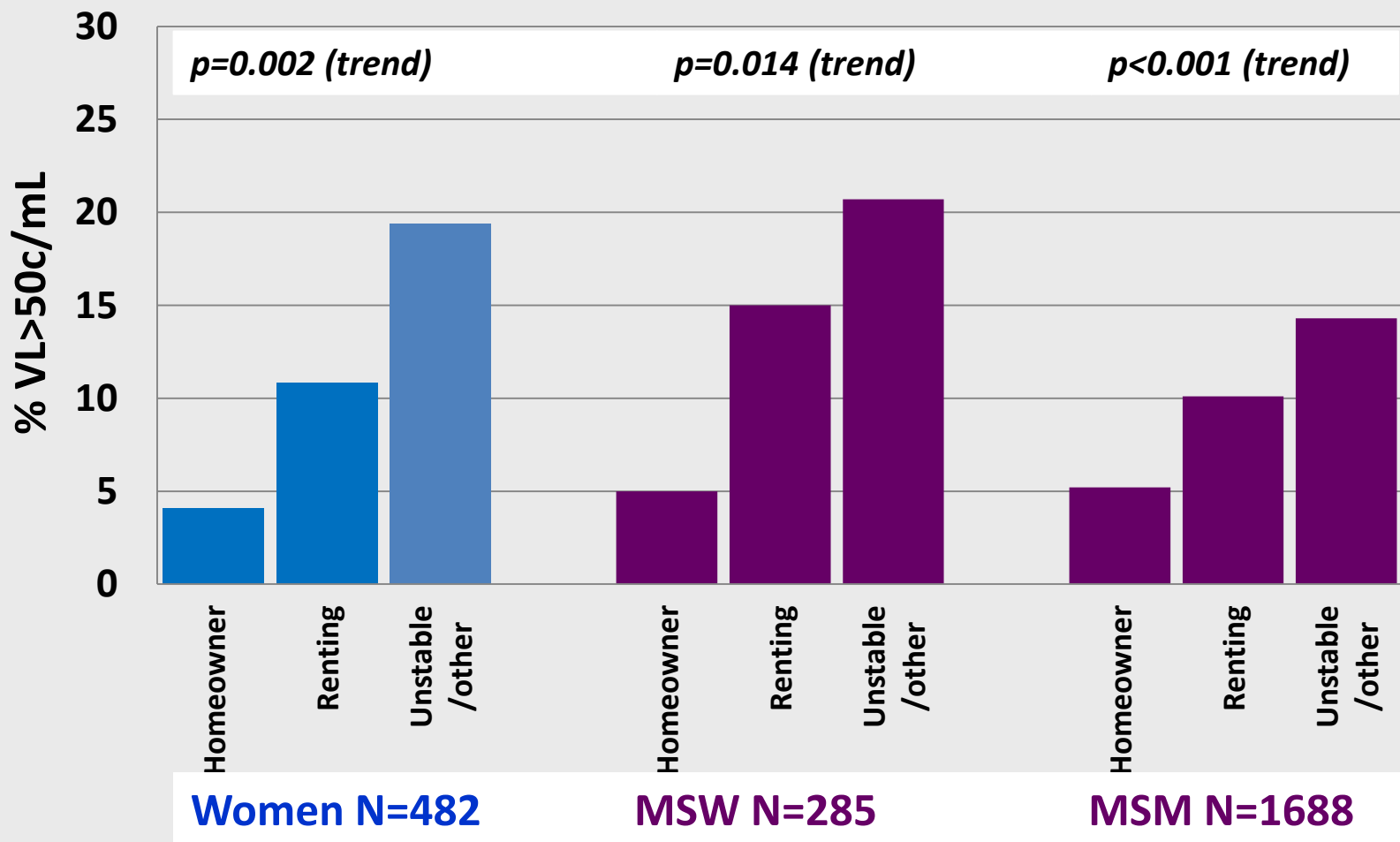
Women N=482

VL>50c/mL by financial status among: women, MSW, MSM, on ART started ≥6 months ago

‘Enough money for basic needs, e.g. food, heating?’



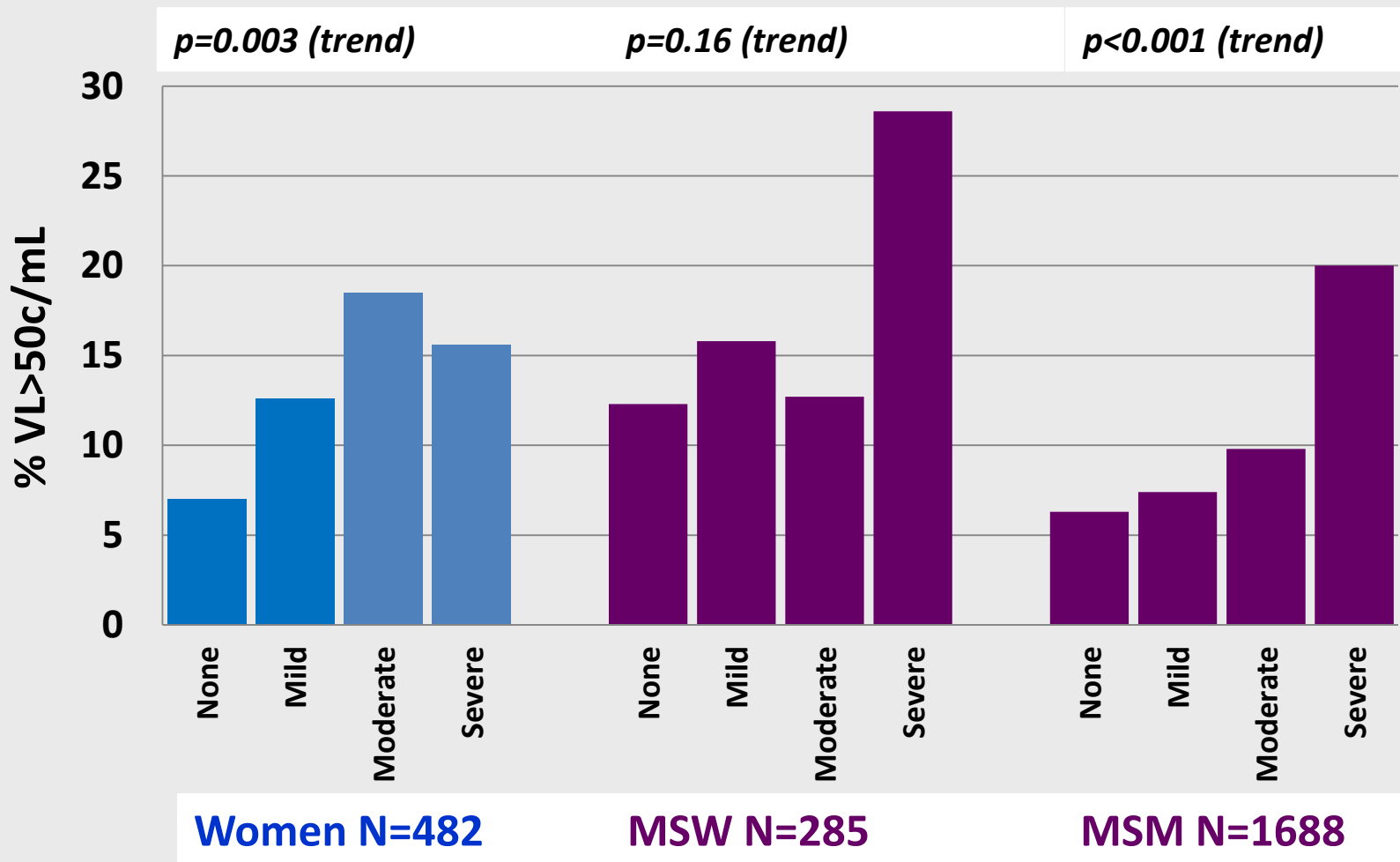
VL>50c/mL by housing status among: women, MSW, MSM, on ART started ≥6 months ago



Renting=private rented, council or housing association

Unstable/other=temporary accommodation, staying with family or friends, homeless, other

VL>50c/mL by depression symptom severity among: women, MSW, MSM, on ART started ≥6 months ago



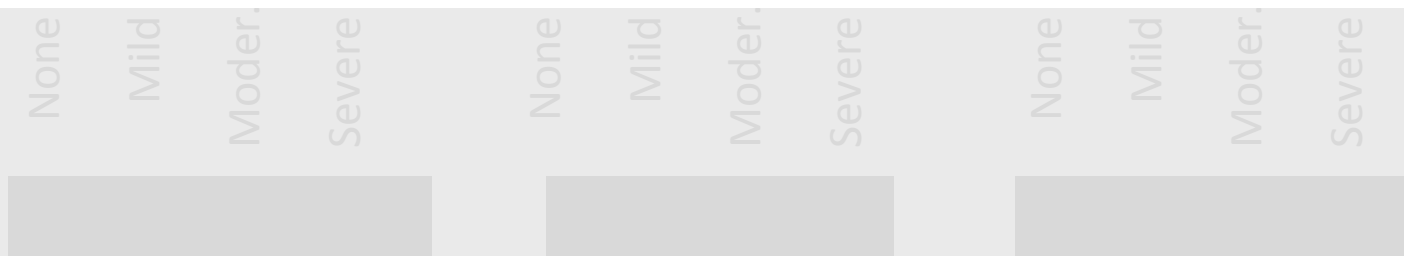
PHQ-9 score. None: 0-4; Mild: 5-9; Moderate: 10-19; Severe: ≥20

VL>50c/mL by depression symptom severity among: women, MSW, MSM on ART >6 months

VL>50c/mL by depression symptom score (PHQ-9)

No evidence that the associations of socio-economic factors or depression with ART non-adherence and VL>50c/mL differed between women, MSW, and MSM

($p > 0.1$ for each factor, interaction tests)



None: 0-4; Mild: 5-9; Moderate: 10-19; Severe: ≥ 20

Questions

Among people with HIV in the UK:

1. How do socio-economic characteristics, ART non-adherence, and VL non-suppression on ART, differ between women MSM, and MSW?
2. Are socio-economic factors & depression associated with ART non-adherence and VL non-suppression among women? (cross-sectional)
3. Are the associations similar among MSM, MSW?
4. **Are socio-economic factors & depression predictive of VL rebound? (longitudinal)**
5. How much do socio-economic factors & depression 'explain' gender variation in ART non-adherence, VL non-suppression, and VL rebound?

VL rebound (first VL >200c/mL) during follow-up by gender/sexuality

N=1586 with VL<50c/mL on ART, started ≥6 months ago [#]	Women N=271	MSW N=163	MSM N=1152
Number with VL>200c/mL during follow-up	24	19	43
Person-years at risk	406	241	1929
Rebound rate* /100 p-y [95% CI]	5.9 [3.7, 8.8]	7.9 [4.8, 12.3]	2.2 [1.6, 3.0]

p<0.001 for comparison across gender/sexuality groups

* First VL>200c/mL after questionnaire date.

Mean (range) follow-up from questionnaire 20 months (range 0.1 to 37 months)

[#]Includes only participants with linked clinic follow-up VL data

Socio-economic factors and VL rebound (>200c/mL)

Rate of VL rebound per 100 person-years	Women N=271	All participants N=1586 VL<50c/mL on ART	
	Rate (events)	Rate (events)	Adjusted HR* (95% CI)
UK born	6.8 (5)	2.6 (39)	1
Non-UK, good English	4.7 (12)	4.2 (36)	0.9 (0.5, 1.7) <i>p=0.92</i>
Non-UK, difficulty English	8.8 (7)	4.9 (11)	1.0 (0.4, 2.2) <i>(trend)</i>
Money for basic needs	1.9 (2)	1.9 (23)	1
Not always enough money	7.3 (22)	4.6 (63)	1.9 (1.1, 3.1) <i>p=0.016</i>
Employed	3.8 (7)	1.9 (28)	1
Not employed	7.6 (17)	5.1 (58)	2.8 (1.8, 4.5) <i>p<0.001</i>
Homeowner	3.2 (2)	1.1 (11)	1
Renting	5.7 (16)	4.3 (59)	3.0 (1.5, 5.8) <i>p=0.001</i>
Unstable / other	10.0 (6)	6.9 (16)	4.3 (1.9, 9.6) <i>(trend)</i>
University education	5.3 (8)	2.3 (25)	1
Non-university education	6.3 (16)	4.1 (61)	1.7 (1.0, 2.7) <i>p=0.034</i>
Higher supportive network	4.1 (12)	2.5 (50)	1
Lower supportive network	10.8 (12)	5.9 (36)	2.3 (1.5, 3.5) <i>p<0.001</i>
No depression symptoms	2.9 (8)	2.0 (38)	1
Depression symptoms	12.6 (16)	6.8 (48)	3.2 (2.1, 5.0) <i>p<0.001</i>

*Adjusted for gender/sexuality, age, ethnicity Hazard ratios by Cox PH regression

Socio-economic factors and VL rebound (>200c/mL)

Rate of VL rebound per 100 person-years	Women N=271	All participants N=1586 VL<50c/mL on ART	
	Rate (events)	Rate (events)	Adjusted HR* (95% CI)
UK born	6.8 (5)	2.6 (39)	1
Non-UK, good English	4.7 (12)	4.2 (36)	0.9 (0.5, 1.7) <i>p</i> =0.92
Non-UK, difficulty English	8.8 (7)	4.9 (11)	1.0 (0.4, 2.2) <i>(trend)</i>
Money for basic needs	1.9 (2)	1.9 (23)	1
Not always enough money	7.3 (22)	4.6 (63)	1.9 (1.1, 3.1) <i>p</i> =0.016
Employed	3.8 (7)	1.9 (28)	1
Not employed	7.6 (17)	5.1 (58)	2.8 (1.8, 4.5) <i>p</i> <0.001
Homeowner	3.2 (2)	1.1 (11)	1
Renting	5.7 (16)	4.3 (59)	3.0 (1.5, 5.8) <i>p</i> =0.001
Unstable / other	10.0 (6)	6.9 (16)	4.3 (1.9, 9.6) <i>(trend)</i>
University education	5.3 (8)	2.3 (25)	1
Non-university education	6.3 (16)	4.1 (61)	1.7 (1.0, 2.7) <i>p</i> =0.034
Higher supportive network	4.1 (12)	2.5 (50)	1
Lower supportive network	10.8 (12)	5.9 (36)	2.3 (1.5, 3.5) <i>p</i> <0.001
No depression symptoms	2.9 (8)	2.0 (38)	1
Depression symptoms	12.6 (16)	6.8 (48)	3.2 (2.1, 5.0) <i>p</i> <0.001

*Adjusted for gender/sexuality, age, ethnicity

Hazard ratios by Cox PH regression

Socio-economic factors and VL rebound (>200c/mL)

Rate of VL rebound per 100 person-years	Women N=271	All participants N=1586 VL<50c/mL on ART	
	Rate (events)	Rate (events)	Adjusted HR* (95% CI)
UK born	6.8 (5)	2.6 (39)	1
Non-UK, good English	4.7 (12)	4.2 (36)	0.9 (0.5, 1.7) <i>p</i> =0.92
Non-UK, difficulty English	8.8 (7)	4.9 (11)	1.0 (0.4, 2.2) <i>(trend)</i>
Money for basic needs	1.9 (2)	1.9 (23)	1
Not always enough money	7.3 (22)	4.6 (63)	1.9 (1.1, 3.1) <i>p</i> =0.016
Employed	3.8 (7)	1.9 (28)	1
Not employed	7.6 (17)	5.1 (58)	2.8 (1.8, 4.5) <i>p</i> <0.001
Homeowner	3.2 (2)	1.1 (11)	1
Renting	5.7 (16)	4.3 (59)	3.0 (1.5, 5.8) <i>p</i> =0.001
Unstable / other	10.0 (6)	6.9 (16)	4.3 (1.9, 9.6) <i>(trend)</i>
University education	5.3 (8)	2.3 (25)	1
Non-university education	6.3 (16)	4.1 (61)	1.7 (1.0, 2.7) <i>p</i> =0.034
Higher supportive network	4.1 (12)	2.5 (50)	1
Lower supportive network	10.8 (12)	5.9 (36)	2.3 (1.5, 3.5) <i>p</i> <0.001
No depression symptoms	2.9 (8)	2.0 (38)	1
Depression symptoms	12.6 (16)	6.8 (48)	3.2 (2.1, 5.0) <i>p</i> <0.001

*Adjusted for gender/sexuality, age, ethnicity Hazard ratios by Cox PH regression

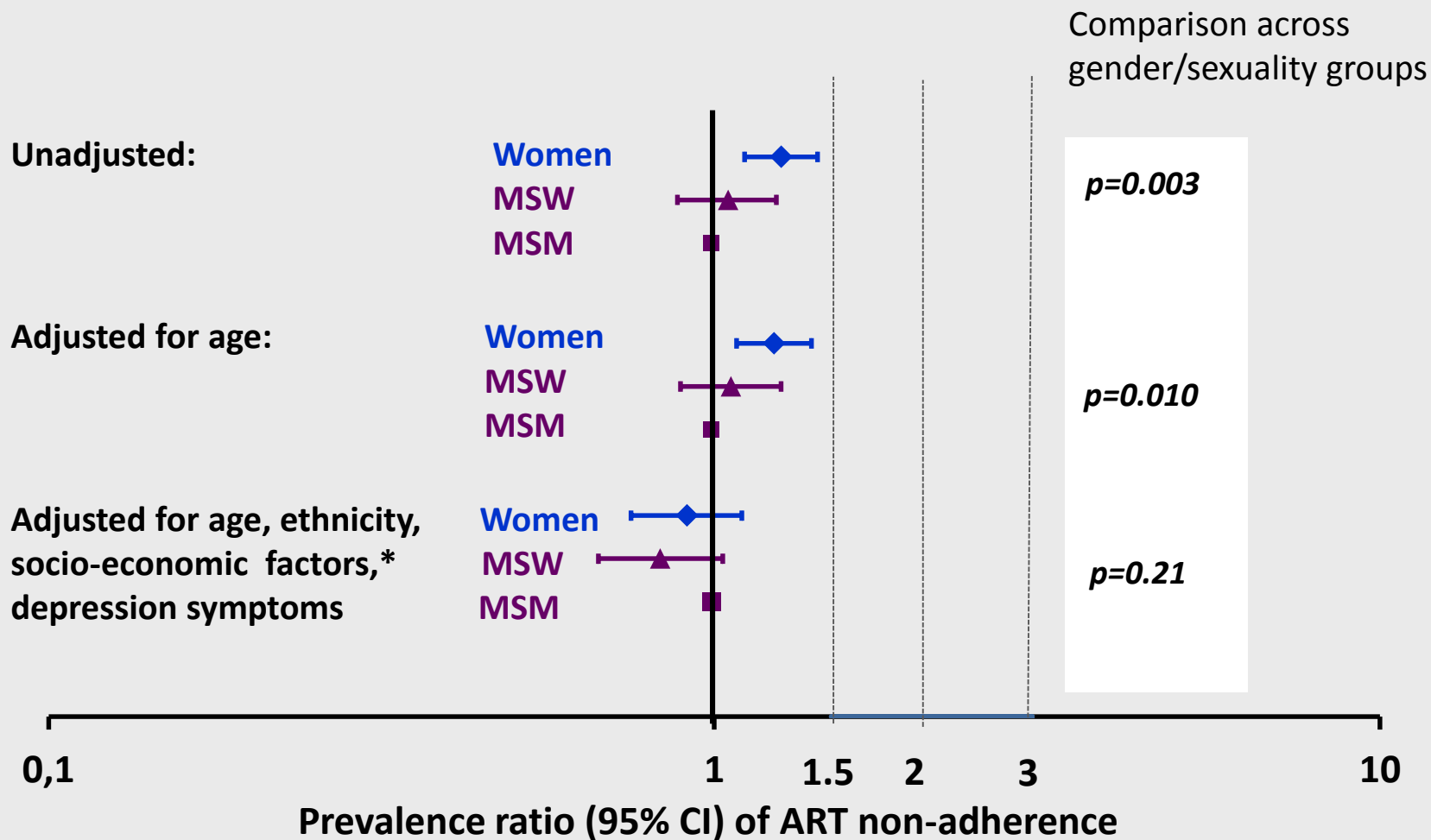
Questions

Among people with HIV in the UK:

1. How do socio-economic characteristics, ART non-adherence, and VL non-suppression on ART, differ between women MSM, and MSW?
2. Are socio-economic factors & depression associated with ART non-adherence and VL non-suppression among women? (cross-sectional)
3. Are the associations similar among MSM, MSW?
4. Are socio-economic factors & depression predictive of VL rebound? (longitudinal)
5. How much do socio-economic factors & depression 'explain' gender variation in ART non-adherence, VL non-suppression, and VL rebound?

Gender/sexuality and ART non-adherence

N=2771 on ART

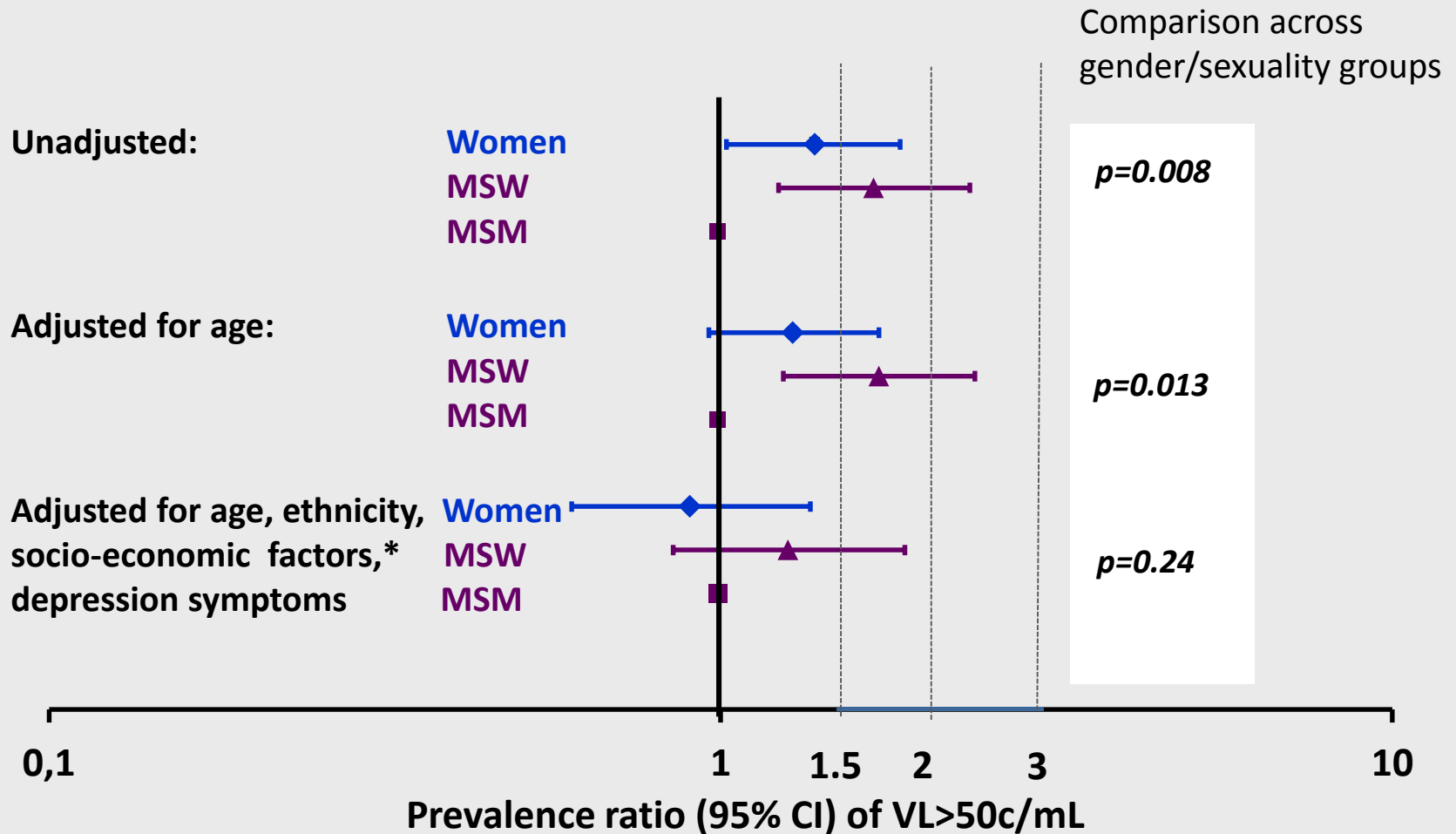


*UK birth/English fluency; financial status; housing; employment; education; supportive network

Prevalence ratios by modified Poisson regression

Gender/sexuality and VL>50c/mL

N=2445 on ART, started ≥6 months ago

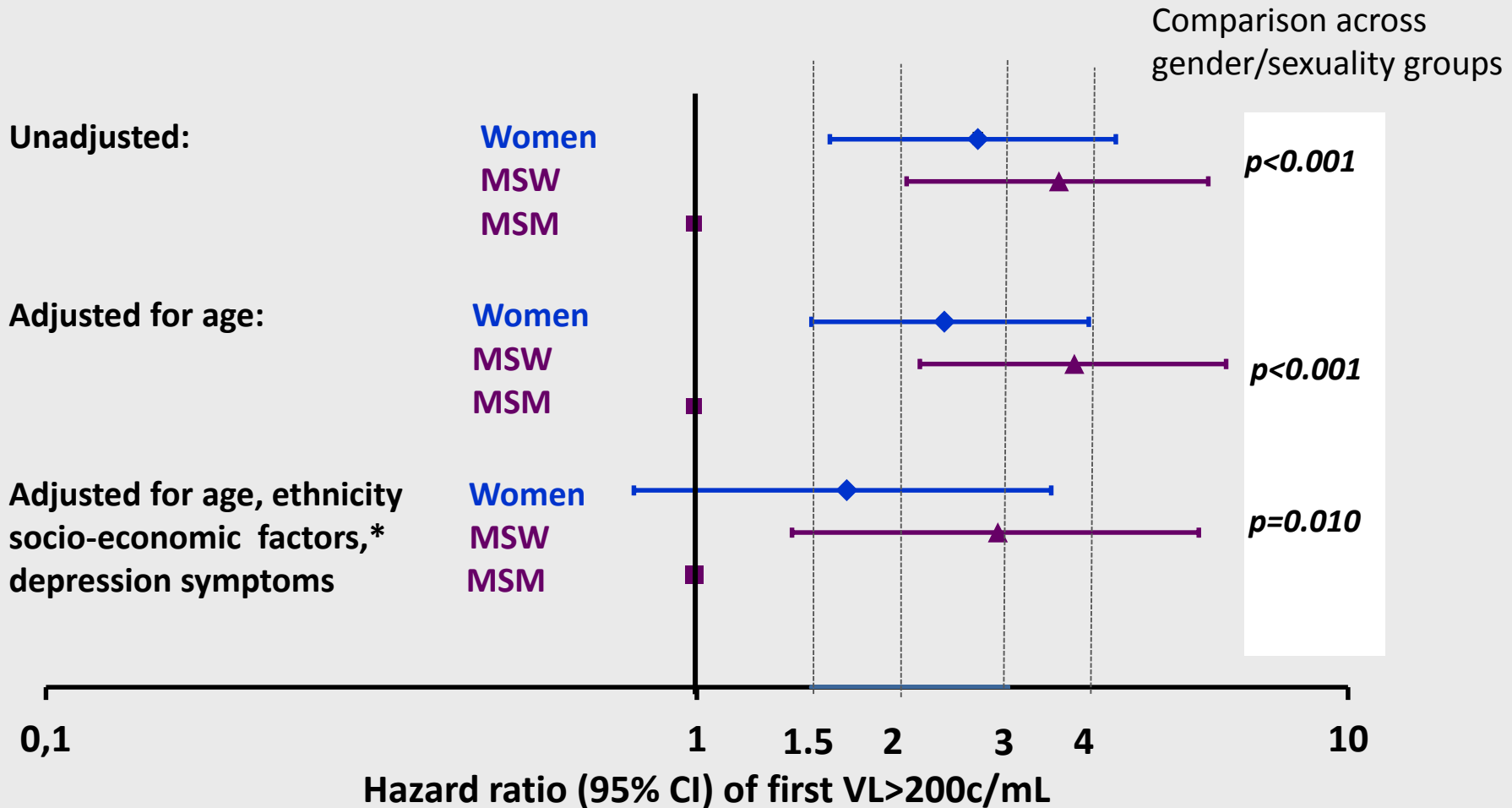


*UK birth/English fluency; financial status; housing; employment; education; supportive network

Prevalence ratios by modified Poisson regression

Gender/sexuality and VL rebound (>200c/mL)

N=1586 with VL<50c/mL on ART, started ≥6m ago



*UK birth/English fluency; financial status; housing; employment; education; supportive network

Hazard ratios by Cox proportional hazards regression

Summary of results from ASTRA

- Levels of socio-economic disadvantage among HIV-positive women and MSW in UK higher than for MSM
- Virological success of ART is high in all groups, but women and MSW have lower ART adherence and poorer VL outcomes than MSM
- Socio-economic disadvantage and symptoms of depression strongly associated with ART non-adherence and poorer VL outcomes among women (as for men)
- Socio-economic disadvantage among women appears to 'explain' much of the difference in ART non-adherence and VL outcomes compared to MSM

Interpretation

Mechanisms of effect?

- Difficulties with ART adherence due to
 - higher stress; competing priorities & responsibilities;
 - unsettled circumstances; migration issues; food insecurity
 - poorer mental health; more comorbidities & medications;
 - stigma; lower self-esteem; knowledge & health beliefs
- Lower attendance/retention in care
- Differences in quality of health care¹, or experiences of care
- Later diagnosis of HIV, later initiation of ART²

Strong adverse effect of socio-economic disadvantage on VL outcome in setting of universal free health care shows impact goes beyond ability to access/afford treatment

¹Carter 2014; ²COHERE group 2014

US/Canadian studies – SES and VL outcomes

- Lower income,¹ lower education,²⁻⁶ non-employment,²⁻⁴ poor housing,^{3,7,8} insurance status^{1,7,9} linked to poorer VL outcomes

N=768 Women Predictor	Univariate Analysis		Multivariable Analysis	
	HR	95% CI	aHR ^a	95% CI
Average annual household income				
≤\$24,000	1.75	(1.30, 2.36)	1.80	(1.19, 2.72)
\$24,001-\$36,000	1.31	(0.88, 1.97)	1.41	(0.90, 2.23)
≥\$36,001	REF		REF	
Currently have AIDS Drug Assistance Program (ADAP)				
No	1.45	(1.14, 1.85)	1.41	(1.02, 1.94)
Yes	REF		REF	
Depressive symptoms				
No	REF		REF	
Yes	1.64	(1.35, 2.00)	1.32	(1.06, 1.66)

Income, ADAP, depression: hazard ratios for association with VL failure.
Women's Interagency Study, 2006-2011. ¹McFall et al. JAIDS 2013; 64: 289-298

²Kalichman 2015; ³Shacham 2010; ⁴Simoni 2013; ⁵Zaragoza-Macias 2010; ⁶Marc 2007;
⁷Muthulingam; ⁸Milloy 2012; ⁹Pence 2008

European studies – SES and VL outcomes

- CoRIS¹ (Spain) - lower education level associated with poorer VL response to ART

Variable	Responders, <i>n</i> /total <i>n</i>	Responders, %	Crude OR (95% CI)	Adjusted OR (95% CI) ^a
Virological response at 6 months				
LOW	618/868	71.2	1	1
MED	484/618	78.3	1.46 (1.16, 1.84)	1.41 (1.10, 1.80)
HIG	289/348	83.0	1.98 (1.46, 2.68)	1.80 (1.22, 2.65)
Total	1,391/1,834	75.8	–	–
Virological response at 1 year				
LOW	539/709	76.0	1	1
MED	428/517	82.8	1.52 (1.20, 1.92)	1.27 (1.01, 1.61)
HIG	238/278	85.6	1.88 (1.44, 2.45)	1.33 (0.97, 1.83)
Total	1,205/1,504	80.1	–	–

N=1834 men and women

Virological response to ART by educational level, CoRIS 2004-2009

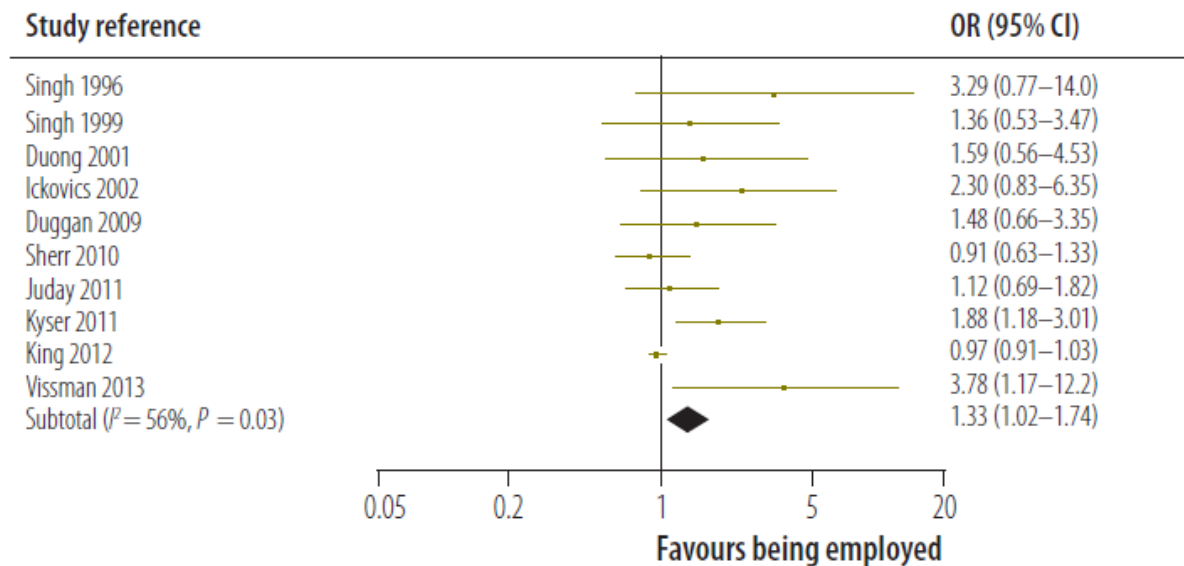
¹*Sobrino-Vegas. Antiviral Therapy 2012; 17: 1-8*

- Swiss HIV Cohort Study^{2,3} – lower education, neighbourhood SES linked to poorer VL response. Poorer VL response among women largely explained by socio-economic factors
- Danish HIV Cohort Study^{4,5} -no effect of education on VL outcomes

²*Rosin 2014;* ³*Gueler 2015;* ⁴*Thorsteinsson 2012;* ⁵*Legarth 2014*

Employment and ART adherence

Fig. 5. Association between being employed and adhering to antiretroviral therapy in studies from high-income countries, 1996–2013

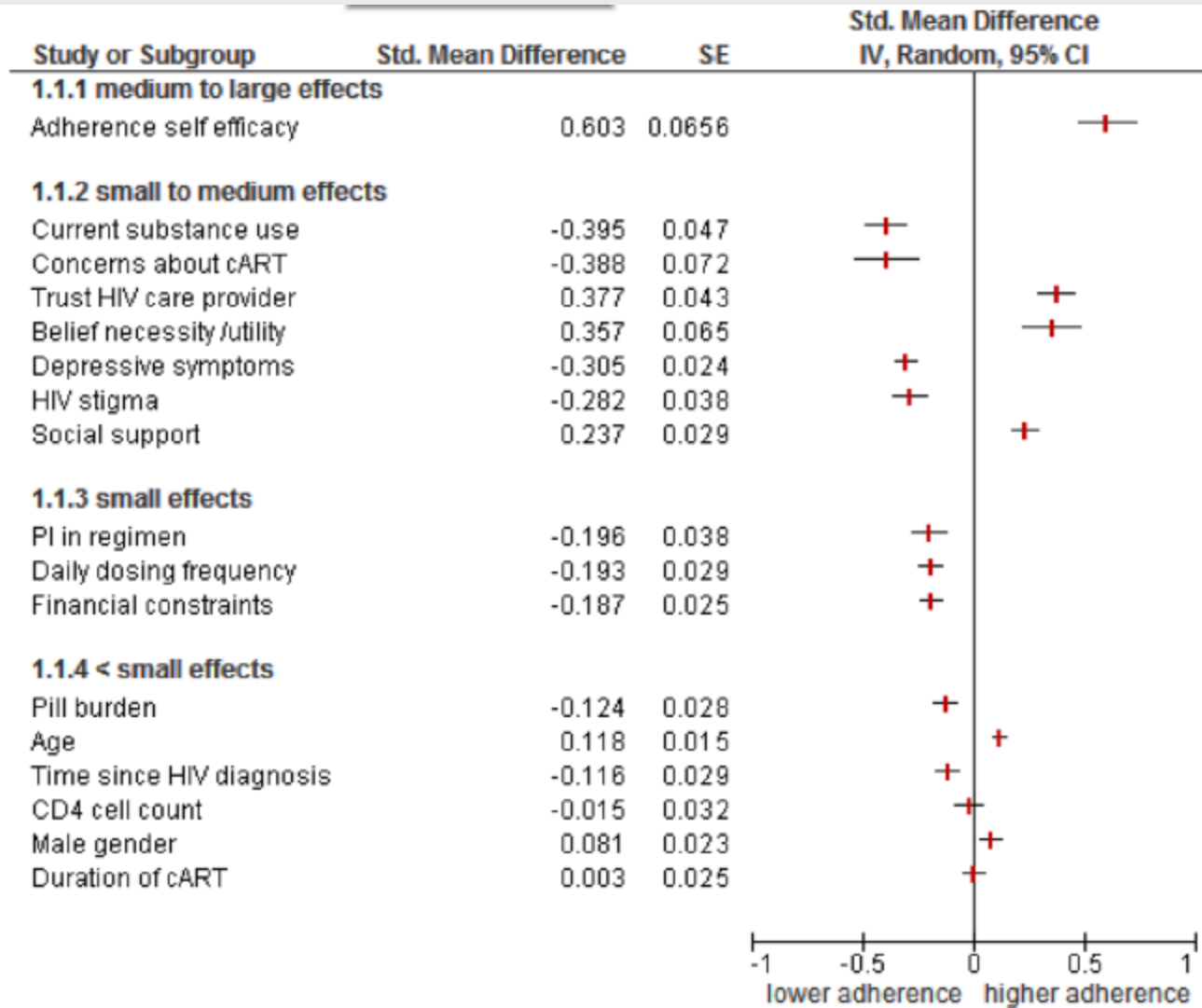


CI: confidence interval; OR: odds ratio.

Subgroup	No. of studies	Pooled association
		OR (95% CI)
Income group^c		
Low	7	1.85 (1.58–2.18)
Middle	11	0.94 (0.62–1.42)
High	10	1.33 (1.02–1.74)

*Meta-analysis.
Nachega et al.
Bulletin WHO
2015; 93: 29-41*

Factors associated with ART adherence



*Meta-analysis:
207 studies.
Langebeek et al.
BMC Medicine
2014; 12: 142*

Figure 2 Predictors/correlates of adherence to anti-retroviral therapy (ART).

Gender and ART non-adherence

- Substantial evidence that ART adherence is lower among women than men (68% of 44 studies in systematic review)

Women and Vulnerability to HAART Non-Adherence: A Literature Review of Treatment Adherence by Gender from 2000 to 2011

Cathy M. Puskas • Jamie I. Forrest • Surita Parashar •
Kate A. Salters • Angela M. Cescon • Angela Kaida •
Cari L. Miller • David R. Bangsberg • Robert S. Hogg

Current HIV/AIDS Reports 2011

- Evidence of higher risk of modification, interruption, discontinuation of ART for women compared to MSW/MSM¹⁻⁸
- Gender effect not apparent for immunological outcomes of ART or mortality risk⁹⁻¹² - most studies **not** found women at greater risk

¹Barber 2011; ²Gonzalez-Sema 2014; ³Murri 2003; ⁴Saunders 2014; ⁵Burch 2015;

⁶Rosin 2014; ⁷Samji 2014; ⁸Hughes 2014; ⁹Jarrin 2008; ¹⁰Cescon 2013; ^{11,12}ART-Cohort Collaboration 2007, 2015

Implications

- Success of HIV treatment dependent on social context – importance of holistic approach to care
- Adherence considerations/support for women and those at risk of poorer VL outcomes due to adverse personal/social circumstances
- Links to support services (benefits, housing, employment, family, mental health)
- Recognition and management of depression
- Emphasising importance of socio-economic disadvantage and the relevance to women in HIV treatment guidelines
- Importance of collection of data on socio-economic factors for routine clinical care and research
- Wider context of gender/socio-economic inequalities in health

Acknowledgments

Lisa Burch, Colette Smith, Rebecca O'Connell
Andrew Phillips, Alison Rodger, Andrew Speakman
Margaret Johnson, Jane Anderson, Anna Maria Geretti
Lorraine Sherr, Jonathan Elford, Yusef Azad, Simon Collins,
Martin Fisher, Richard Gilson, Ed Wilkins, Monica Lascar,
Martin Jones

Acknowledgments



Thank you to all ASTRA study participants

ASTRA clinic teams

Royal Free Hospital: *Alison Rodger; Margaret Johnson; Jeff McDonnell; Adebisi Aderonke*

Mortimer Market Centre: *Richard Gilson; Simon Edwards; Lewis Haddow; Simon Gilson; Christina Broussard; Robert Pralat; Sonali Wayal*

Brighton and Sussex University Hospital: *Martin Fisher; Nicky Perry; Alex Pollard; Serge Fedele; Louise Kerr; Lisa Heald; Wendy Hadley; Kerry Hobbs; Julia Williams; Elaney Youssef; Celia Richardson; Sean Groth*

North Manchester General Hospital: *Ed Wilkins; Yvonne Clowes; Jennifer Cullie; Cynthia Murphy; Christina Martin; Valerie George; Andrew Thompson*

Homerton University Hospital: *Jane Anderson; Sifiso Mguni; Damilola Awosika; Rosalind Scourse*

East Sussex Sexual Health Clinic: *Kazeem Aderogba; Caron Osborne; Sue Cross; Jacqueline Whinney; Martin Jones*

Newham University Hospital: *Rebecca O'Connell; Cheryl Tawana*

Whipps Cross University Hospital: *Monica Lascar; Zandile Maseko; Gemma Townsend; Vera Theodore; Jas Sagoo*

ASTRA core team: *Fiona Lampe; Alison Rodger; Andrew Speakman; Andrew Phillips*

ASTRA data management: *Andrew Speakman; Marina Daskalopoulou; Fiona Lampe*

ASTRA advisory group: *Lorraine Sherr; Simon Collins; Jonathan Elford; Alec Miners; Anne Johnson; Graham Hart; Anna-Maria Geretti; Bill Burman*

CAPRA grant Advisory Board: *Nick Partridge; Kay Orton; Anthony Nardone; Ann Sullivan*

The ASTRA study presents independent research funded by the National Institute for Health Research (NIHR) under its Programme Grants for Applied Research funding scheme (RP-PG-0608-10142). The views expressed in this presentation are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health