

# HIV, hepatitis and syphilis prevalence and correlates of condom use during anal sex among men who have sex with men in the Republic of Moldova

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**Summary:** Limited data on HIV prevalence and related risks among men who have sex with men (MSM) exist in the Republic of Moldova. In Chisinau and Balti, 188 and 209, respectively, men who reported having anal or oral sex in the last six months with another man, aged  $\geq 16$  years were recruited into a study in 2010 using respondent-driven sampling methods. MSM reported having multiple male and female partners and inconsistent condom use. In Chisinau, 2% of MSM were HIV seropositive, 3.7% had antibodies to hepatitis C (HCV), 5.7% had antibodies to hepatitis B (HBV) and 12.1% had syphilis. In Balti, less than 1% of MSM were HIV seropositive, 1.2% had antibodies to HCV, 3.2% had antibodies to HBV and only 0.5% had syphilis. MSM who used a condom at last anal sex with a man were less likely to reside in Chisinau, to have casual sex partners and to have had an HIV test in the last year and were more likely to know where to get an HIV test. Although HIV prevalence was low, MSM practice a number of risky sexual behaviours that may heighten the risk of further HIV transmission in this population and to the wider population.

**Keywords:** Moldova, HIV/AIDS, men who have sex with men, hepatitis, sexually transmitted infections, respondent-driven sampling, high-risk sexual behaviour

## INTRODUCTION

The Republic of Moldova (population 4.1 million) is a low-income country in Eastern Europe, bordering Romania and Ukraine.<sup>1</sup> Following independence from the Soviet Union in 1991, Moldova has suffered massive economic upheavals resulting in decreased public expenditures for social programmes and health care. HIV in the general population in Moldova is relatively low at <1% and, as of 2012, 7125 HIV cases have been registered in Moldova, accounting for only half of the expected number of people in the country to be infected with HIV.<sup>2</sup> Among the current registered HIV cases, 52% are men, 61% are from urban areas and 86% were infected through sexual transmission.<sup>2,3</sup> To date, from 0 to five HIV cases per year are reportedly related to male-to-male sex, and only 40 registered HIV-positive men have reported ever having sex with men.<sup>3,4</sup> Recent surveillance activities among men who have sex with men (MSM) have found HIV prevalence to range from 1.7% in 2004 to 4.8% in 2007.<sup>2,5–7</sup> Although no longer illegal, homosexuality in Moldova is highly stigmatized and reported HIV cases attributable to

male-to-male sex are likely to be underestimated. High levels of stigma and discrimination towards MSM increase this population's vulnerability to HIV and make it difficult to measure HIV prevalence, related risk factors, programme coverage and areas for further interventions.

In 2010, the Moldova Ministry of Health conducted an integrated bio-behavioural survey (IBBS) among MSM in Chisinau and Balti, using respondent-driven sampling (RDS) to estimate HIV, syphilis and hepatitis C (HCV) and B (HBV) prevalence and related risk behaviours. The sampling method, RDS, uses a link tracing technique whereby peers recruit their peers. Data are collected about social network sizes and recruitment patterns to determine selection probabilities.<sup>8–10</sup> RDS is now commonly used throughout the world as an effective method to sample hard-to-reach and hidden populations at risk for HIV.<sup>11,12,13</sup>

Chisinau and Balti were selected because of their population sizes, geographic location, economic importance and the existence of services for MSM and HIV. Chisinau, Moldova's capital, is the country's largest city and its political, administrative, economic and cultural centre. Balti, located in the north of Moldova, is the second largest (in terms of population) city in the country. This paper presents descriptive findings of sexual and substance use behaviours and disease prevalence and examines which sociodemographic, sexual risks and infections are correlated with condom use at last anal sex among MSM in Chisinau and Balti, Moldova.

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## METHODS

### Sampling

RDS was used to sample men who reported having anal or oral sex in the last six months with another man aged  $\geq 16$  years, and living in one of the cities in which the survey was conducted. The sample size was rounded to 250 respondents in each survey location based on a calculation to measure change over time using a baseline prevalence for condom use at last sex with a man of 50%, 95% confidence, 80% power and a design effect of 2.0.

Formative research with MSM and organization staff working with MSM was carried out before survey data collection in order to pilot the questionnaire, determine survey logistics and to identify seeds (initial recruits) with large social networks and diverse characteristics. Data collection began with eight seeds in Chisinau and five seeds in Balti. After seeds provided informed consent and completed the survey requirements (face-to-face interview in Romanian or Russian, pretest counselling and venous blood draw for HIV, HBV, HCV and syphilis testing), they were given three recruitment coupons each to recruit the first wave of participants into the survey. Subsequent waves of participants (who completed the survey requirements) also received up to three recruitment coupons to recruit additional participants. All participants received a primary compensation of US\$8.3 for participation in the survey and a secondary compensation of US\$5.8 for each additional eligible recruit who participated in the survey.

Participants had the opportunity to receive their test results, together with post-test counselling after two (in Chisinau) or six (in Balti) days after providing a blood specimen. Those with positive test results were referred to voluntary testing and counselling (VCT) centres or to the public primary health-care system for further management. This survey was approved by the Moldova National Ethics Committee.

### Data collection

The questionnaire included items about sociodemographic characteristics, substance use, sexual risk behaviours with male and female partners and HIV testing. As required for RDS analysis, participants were asked about the number of persons they know, who also know them, and have seen in the previous month and who fulfil the study eligibility. Once participants completed the questionnaire, they were asked to provide 5 ml of venous blood, collected by a trained phlebotomist, for HIV, HBV, HCV and syphilis testing. HIV P24 antigen and HIV1 and HIV2 antibodies were detected using an enzyme immunoassay (Genscreen Ultra HIV Ag-Ab; BIORAD, Marnes la Coquette, France). Syphilis infection was tested with TPHA (Vector Best, Novosibirsk, Russia), a haemagglutination test for *Treponema pallidum* antibodies (IgG and IgM) in serum. HBV surface antigen (HBsAg) was detected using HBsAg Ultra (Dia Pro, Milano, Italy) and antibodies to HCV were detected using anti-HCV (Dia Pro, Milano, Italy). To ensure confidentiality, participants' coupons, questionnaires, specimens and test results were identified using a unique study identification number. A coupon manager system was used to monitor recruitment and incentive distribution. No personal identifying information was collected.

### Data analysis

Estimates and 95% confidence intervals (CI) (Table 1) were calculated with RDS Analyst version 9.0 ([www.hpmrg.org](http://www.hpmrg.org)) using

the successive sampling estimator.<sup>13</sup> Data from both cities were pooled for bivariate and multivariate logistic regressions (Table 2) to identify statistically significant correlates of condom use at last anal sex with a man using RDS Analysis Tool (RDSAT version 6.0) generated survey weights using the Salganik-Heckathorn estimator.<sup>10</sup> Variables associated with condom use at last anal sex at  $P < 0.2$  in bivariate analysis were included in the initial multivariate model. We included the sociodemographic variables of age, living situation, education and nationality and the sexual risk behaviours of frequency of sexual contacts, recent (past 6 months) sex with different types of male partners (permanent, commercial and occasional) and with women. To test whether condom use was impacted by alcohol and drug use we also included substance use variables. Finally, we included variables on STI and HIV testing history and infection prevalences. The multivariate regression was controlled for by city, and variables that remained associated with condom use at last anal sex at a  $P < 0.05$  significance level or were considered important confounders were retained in the model. Adjusted odds ratios (AORs) and 95% CI were estimated and presented in the final model.

## RESULTS

The study was conducted from April to August 2010. Data were collected from 188 MSM in Chisinau and 209 in Balti, of whom 182 in Chisinau and all in Balti agreed to be tested for HIV and other infections. Ten persons were found to be ineligible in Chisinau and no one was found to be ineligible in Balti. A maximum number of six waves were generated for each sample.

### Demographic variables

The majority of MSM in Balti were aged from 16 to 19 years (67.8%; median 19) whereas the majority of MSM in Chisinau were aged from 20 to 29 years (53.4%, median 21). Most men in both cities were not married (Chisinau 76.3% and Balti 89.8%), and few (Chisinau 6.7% and Balti 3.9%) reported living with a male sexual partner. Fifty percent of MSM in Chisinau and 17.4% in Balti reported having higher than a middle education. In Chisinau 33.5% and in Balti 21.5% of MSM reported having permanent employment. A large percentage of MSM in Balti reported being students (47.3%). Seventy-seven percent in Chisinau and 45.1% in Balti reported being Moldovan. In Balti, 32% of MSM reported being Russian (versus 10% in Chisinau) and 22% reported being Ukrainian (versus 9.6% in Chisinau).

### Sexual behaviours with men

The largest proportion of MSM in Chisinau reported being 19 years or older when they had their first sexual encounter with another man, whereas in Balti the largest proportion were between the ages of 15 and 16 years old. Most MSM in both cities (Chisinau 59.6% and Balti 62.4%) reported only one male anal or oral sexual partner in the previous six months and 61.8% of MSM in Chisinau and almost all (97.3%) in Balti reported having anal sex with a man in the previous six months. When asked the number of male receptive anal partners (participant is insertive) in the last six months, the majority

Table 1 Sociodemographic, HIV/STI risk behaviours and sex work characteristics of men who have sex with men in Chisnau and Balti, Moldova, 2010

	Chisnau N = 188			Balti N = 209		
	N	%	(95% CI)*	n	%	(95% CI)*
<b>Sociodemographic characteristics</b>						
Age						
≤19 years	34	21.6	11.9, 31.4	115	67.8	57.3, 78.2
20–29 years	95	53.4	42.7, 64.2	61	21.9	14.7, 29.1
30–39 years	23	7.2	3.6, 11.9	28	8.7	4.6, 12.8
≥40 years	36	17.2	7.0, 27.5	5	1.7	0.3, 3.0
Marital status						
Not married	137	76.3	66.4, 86.1	182	89.8	86.1, 93.5
Married	14	6.0	0.9, 11.1	6	1.9	0.5, 3.3
Living with someone	13	6.6	3.0, 10.2	11	4.1	1.9, 6.2
Divorced/widowed	24	11.1	4.7, 17.6	10	4.2	1.9, 6.6
Live-in male sexual partners (lived together ≥6 months)						
Yes	21	6.7	4.0, 9.5	12	3.9	1.1, 6.6
No	167	93.3	90.5, 96.0	197	96.1	93.4, 98.9
Education						
Middle education or less	77	49.6	41.4, 57.8	159	82.6	77.9, 87.3
Higher than middle education	111	50.4	42.2, 58.7	50	17.4	12.7, 22.1
Type of employment						
Permanent	68	33.5	24.3, 42.6	53	21.5	15.4, 27.5
Part-time	51	25.1	16.8, 33.4	38	14.9	8.7, 21.1
Student	25	15.3	8.5, 22.1	82	47.3	38.3, 56.3
Unemployed	32	18.5	10.9, 26.1	30	15.0	9.3, 20.8
Other	12	7.6	3.0, 12.2	6	1.3	0.5, 2.1
Nationality						
Moldovan	145	77.4	70.3, 84.5	95	45.1	38.0, 52.2
Russian	23	10.1	5.8, 14.4	65	31.8	25.9, 37.6
Ukrainian	15	9.6	4.1, 15.2	46	22.0	16.5, 27.6
Other	5	2.9	-0.1, 5.9	3	1.1	0.1, 2.1
<b>General sexual behaviours</b>						
Age at first sexual encounter (oral/anal sex) with a man						
<14	23	11.2	5.5, 16.8	68	29.7	23.8, 35.6
15–16	31	10.3	6.7, 13.9	103	48.7	40.4, 56.9
17–18	43	24.8	16.6, 33.0	27	17.6	10.2, 25.0
19+	91	53.7	45.1, 32.4	11	4.0	1.5, 6.6
Number of male sex contacts in last 6 months (oral/anal sex)						
1	89	59.6	51, 68.2.0	112	62.4	54.4, 70.3
2–3	52	21.3	15.7, 27.0	83	34.1	26.6, 41.5
4+	47	19.1	11.2, 26.9	14	3.6	1.8, 5.4
Anal sex with men within the last 6 months						
Yes	140	61.8	50.9, 72.7	204	97.3	94.9, 99.7
No	48	38.2	27.3, 49.1	5	2.7	0.3, 5.1
Number of male anal receptive sex partners in last 6 months (participant is active)						
1	79	61.9	53.2, 70.6	113	62.7	56.8, 68.6
2–3	37	23.0	14.5, 31.6	80	34.3	28.8, 39.8
4+	24	15.1	6.0, 24.1	11	3.0	1.3, 4.7
Number of male anal insertive sex partners in last 6 months (participant is passive)						
1	91	69.2	59.7, 78.7	139	74.6	67.5, 81.7
2–3	34	20.9	12.0, 29.8	56	23.2	16.2, 30.2
4+	15	9.9	2.2, 17.7	9	2.2	1.0, 3.4
Used condom during last anal sex with a man						
Yes	81	54.4	41.4, 67.5	150	75.7	69.5, 82.0
No	59	45.6	32.6, 58.7	54	24.3	18.0, 30.6
Frequency of condom use with men (ever)						
Never	29	22.2	15.0, 29.5	21	12.5	7.2, 17.8
Sometimes	129	56.7	46.2, 67.3	152	67.9	59.1, 76.8
Always	30	21.1	10.7, 31.4	36	19.6	13.1, 26.0
Used condom at last sex with any partner (male or female)						
Yes	90	44.3	36.6, 52.0	142	72.2	66.7, 77.6
No	98	55.7	48.0, 63.4	67	27.8	22.4, 33.3
<b>Sexual behaviours: regular male partners</b>						
Regular partners (did not live with) in last 6 months						
Yes	102	42.2	33.5, 51.0	140	63.7	56.5, 71.0
No	86	57.8	49.0, 66.5	69	36.3	29.0, 43.4
Used condom during last anal sex with regular partner						
Yes	50	61.3	49.0, 73.5	92	71.0	64.1, 77.9
No	36	38.7	26.5, 51.0	44	29.0	22.2, 35.9
Frequency of condom use with regular partners (did not live with) in last 6 months						
Never	16	51.5	2.0, 78.6	33	21.6	14.5, 28.6
Sometimes	15	32.3	0.1, 68.9	37	25.4	17.4, 33.5
Always	14	16.2	0.1, 65.7	66	53.0	44.2, 61.8

(Continued)

Table 1 Continued

	Chisinau N = 188			Balti N = 209		
	N	%	(95% CI)*	n	%	(95% CI)*
<b>Sexual behaviours: commercial male partners</b>						
Commercial sexual partners in last 6 months						
Yes	30	22.7	16.0, 29.4	7	2.1	0.5, 3.8
No	158	77.3	70.6, 84.0	202	97.9	96.2, 99.5
Used condom during last anal sex with commercial partner						
Yes	6	24.2	—	5	71.4	—
No	19	75.8	—	2	28.6	—
<b>Sexual behaviours: casual male partners in last 6 months</b>						
Yes	90	47.0	37.4, 56.7	104	49.1	41.8, 56.4
No	98	53.0	43.3, 62.6	105	51.0	43.7, 58.2
Used condom during last anal sex with casual partner						
Yes	45	70.6	57.1, 84.0	91	89.8	79.9, 99.7
No	20	29.4	16.0, 42.9	10	10.2	0.3, 20.1
Frequency of condom use with casual partners in last 6 months						
Never	10	17.1	9.8, 24.4	8	9.4	2.9, 15.9
Sometimes	29	45.2	31.6, 58.9	22	16.1	10.9, 21.4
Always	25	37.7	24.2, 51.1	71	74.5	67.2, 81.8
<b>Sexual behaviours: female partners</b>						
Ever had vaginal/anal sexual intercourse with women						
Yes	113	83.8	73.9, 93.7	94	59.5	51.9, 67.0
No	30	16.2	6.3, 26.1	94	40.6	33.0, 48.1
Sexual intercourse with women in last 12 months (among all MSM)						
Yes	82	56.4	46.9, 65.9	71	42.2	34.2, 50.2
No	106	43.6	34.0, 53.1	138	57.8	49.8, 65.8
Age at first sexual contact with a woman						
<14	37	28.1	17.7, 38.4	31	27.6	16.5, 38.6
15–16	60	41.2	30.0, 52.5	48	48.1	37.6, 58.6
17–18	30	16.7	9.2, 22.2	27	20.1	12.6, 27.6
19+	31	15.0	8.3, 21.7	9	4.3	1.5, 7.1
Number of female sex partners ever						
1	28	9.7	5.1, 14.3	21	18.4	9.7, 27.2
2–3	38	19.6	14.0, 25.1	32	30.0	18.0, 42.1
4+	96	70.1	62.8, 78.7	61	51.5	39.2, 63.9
Frequency of condom use during sexual intercourse with women (ever)						
Never	19	25.4	8.9, 41.9	7	9.9	2.5, 17.3
Sometimes	33	53.4	36.8, 70.1	29	42.2	23.1, 61.4
Always	20	21.2	9.9, 32.4	29	47.9	32.6, 63.1
Frequency of condom use during sexual intercourse with women in last 12 months						
Never	19	20.7	9.9, 31.5	7	8.1	2.9, 13.4
Sometimes	46	63.3	49.6, 77.1	32	42.4	26.1, 58.8
Always	17	16.0	4.1, 27.9	32	49.4	35.0, 63.8
<b>Alcohol and drug use</b>						
Alcoholic drinks in last month (30 days)						
Yes	164	82.6	74.9, 90.2	174	84.0	78.4, 89.5
No	24	17.4	9.8, 25.1	35	16.0	10.5, 21.6
Ever used drugs						
Yes	44	26.1	16.3, 35.9	5	2.5	0.0, 5.0
No	144	73.9	64.1, 83.7	204	97.5	95.0, 100
Ever injected drugs						
Yes	4	2.4	0.4, 5.2	0	0.0	—
No	184	97.6	94.7, 100	209	100	—
<b>STI and HIV health characteristics</b>						
Had unusual anal discharge or ulcerations in last 12 months						
Yes	0	0.0	—	0	0.0	—
No	188	100	—	209	100	—
Knows where to get an HIV test						
Yes	115	59.8	49.4, 70.2	105	53.2	41.0, 65.4
No	67	40.2	29.8, 50.6	81	46.8	34.7, 59.0
Has ever had an HIV test						
Yes	66	27.4	19.6, 35.2	16	6.9	4.0, 9.9
No	122	72.6	64.8, 80.4	192	93.1	90.1, 96.0
HIV test in the past 12 months						
Yes	35	13.3	7.7, 18.9	10	3.5	1.6, 5.4
No	153	86.7	81.1, 92.3	198	96.5	94.6, 98.4
<b>Infections prevalence</b>						
HIV						
Yes	5	1.9	0.4, 3.4	1	0.2	0.0, 0.5
No	177	98.1	96.6, 99.6	208	99.8	99.5, 100
Hepatitis C						
Yes	10	3.7	1.1, 6.2	3	1.2	0.0, 2.5
No	172	96.3	93.8, 98.9	206	98.8	97.5, 100

(Continued)

Table 1 Continued

	Chisinau N = 188			Balti N = 209		
	N	%	(95% CI)*	n	%	(95% CI)*
Hepatitis B						
Yes	11	5.7	1.2, 10.1	7	3.2	0.9, 5.5
No	171	94.3	89.9, 98.8	201	96.8	94.5, 99.1
Syphilis						
Yes	26	12.1	6.1, 18.0	1	0.4	0.0, 0.9
No	156	87.9	82.0, 93.9	208	99.6	99.1, 100

CI = confidence interval; STI = sexually transmitted infection

(Chisinau 61.9% and Balti 62.7%) reported one such partner (compared with 2–3 or 4+ partners); this was also the case when asked the number of male insertive anal partners (participant is receptive) in the last six months (Chisinau 69.2% and Balti 74.6%). Close to half (54.4%) of MSM in Chisinau and three-quarters in Balti reported using a condom at last anal sex with a man and 40% in Chisinau and 72.2% in Balti reported using a condom at last anal sex with any partner. The majority of MSM in both cities reported inconsistent lifetime condom use with male anal sex partners (sometimes used condom: Chisinau 56.7% and Balti 67.9%).

Forty-two percent of MSM in Chisinau and 63.7% in Balti reported having regular partners (with whom they did not live) in the last six months. Among those, the majority in both cities reported using a condom at last anal sexual contact with a regular partner; however, in Chisinau the percentage of MSM reporting always using a condom in the past six months with regular partners was 16.2% and in Balti was 53%.

Twenty-three percent in Chisinau and 2.1% in Balti reported having commercial sexual partners in the past six months and, among those, 24.2% in Chisinau and 71.4% in Balti reported using a condom during their last anal sexual contact with a commercial partner. Just below half of MSM in both cities reported having casual or occasional sex partners in the last six months and among those the majority reported using a condom at last anal sexual contact with a casual partner (Chisinau 70.6% and Balti 89.8%). Thirty-eight percent in Chisinau (37.7%) compared with Balti (74.5%) reported always using a condom in the past six months with casual partners.

### Sexual behaviours with females

The majority of MSM in both cities reported having vaginal or anal sex with a woman in their lifetime and, among all MSM, 56% in Chisinau and 42% in Balti reported sexual intercourse with a woman in the last 12 months. Among those who reported ever having vaginal or anal sex with a woman, roughly 70% in both cities had their first sexual contact with a female when they were 16 years or younger. Seventy percent (median 4) of MSM in Chisinau and 51.1% (median 4) in Balti reported having four or more female sexual partners in their lifetime. In Chisinau a lower percentage of MSM reported always using a condom during any lifetime sexual intercourse with women compared with Balti (21.2% versus 47.9%).

### Alcohol and drug use

More than 80% of MSM reported having alcoholic drinks in the past month. Twenty-six percent in Chisinau and only 2.5% in

Balti reported ever using drugs and 2.4% in Chisinau and no one in Balti reported ever injecting drugs.

### STI signs and symptoms HIV testing

No MSM reported having unusual anal discharge or ulcerations in the last 12 months. More than 50% in Chisinau and Balti know where to get an HIV test; however, few have had an HIV test in their lifetime (Chisinau 27.4% and Balti 6.9%) or in the past year (Chisinau 13.3% and Balti 3.5%).

### HIV, hepatitis and STI status

Overall, infection prevalence was higher in Chisinau compared with Balti. HIV seroprevalence was 2% among MSM in Chisinau and below 1% for MSM in Balti. HCV was 3.7% in Chisinau and 1.2% in Balti; HBV was 5.7% in Chisinau and 3.2% in Balti and syphilis infection was 12.1% in Chisinau and 0.4% in Balti.

### Correlates of condom use

In the bivariate regression analysis, MSM who used a condom at last anal sex with a man, compared with those who did not, were less likely to reside in Chisinau, be married, have had commercial sex partners in the past six months, and have had an HIV test in the past 12 months and more likely to have had casual sex partners in the past six months. In multivariate analysis, controlling for age and city, MSM who used a condom at last anal sex with a man were less likely to reside in Chisinau, to have had casual male sex partners in the past six months and to have had an HIV test in the past 12 months and less likely to know where to get an HIV test. Neither substance use nor infections were correlated with condom use in either the bivariate or multivariate regression.

### DISCUSSION

MSM in Moldova have relatively low infection prevalence but practice high-risk sexual behaviours including early sexual debut, having multiple partners and inconsistent condom use. More than one-half of MSM in Chisinau and almost one-third in Balti reported unprotected anal sex at last intercourse with a man and just over one-quarter in both cities reported more than two male insertive anal sex partners (whereby participant is receptive) in the past six months. Low condom usage has been found in other surveys of MSM conducted in neighbouring countries and throughout the region.<sup>14–16</sup> These behaviours

Table 2 Correlates of condom use at last anal sexual contact with a man ( $n = 231$ ) among men who have sex with men in Moldova, 2010

	OR	(95% CI)	AOR	(95% CI)
<b>Sociodemographic</b>				
City (ref. Balti) Chisinau	0.38**	(0.21, .66)	0.45**	(0.25, .81)
Age (ref. $\leq 30$ years) $\geq 31$ years	0.77	(0.39, 1.51)	1.48	(0.75, 2.92)
Current living situation (ref. not married) Married Living with someone Divorced/widowed	0.30* 0.67 1.06	(0.11, .88) (0.22, 2.05) (0.41, 2.77)	— — —	— — —
Education (ref. middle education or less) Higher than middle education	0.59	(0.34, 1.04)	—	—
Nationality (ref. Moldovan) Russian, Ukrainian, other	0.82	(0.46, 1.46)	—	—
<b>General sexual behaviours</b>				
Number of male sexual contacts in last 6 months (oral/anal sex) (ref. 1) 2+	1.15	(0.61, 2.18)	—	—
Regular male partners (did not live with) in 6 months (ref. no) Yes	0.99	(0.54, 1.80)	—	—
Commercial male sexual partners in last 6 months (ref. no) Yes	0.21**	(0.08, 0.58)	0.70	(0.37, 1.31)
Casual male sexual partners in last 6 months (ref. no) Yes	2.73***	(1.55, 4.79)	0.27*	(0.09, 0.84)
Sexual intercourse with a woman in last 6 months (ref. no) Yes	0.95	(0.54, 1.69)	—	—
<b>Substance use</b>				
Alcoholic drinks in last month (30 days) (ref. no) Yes	1.52	(0.67, 3.43)	—	—
Ever used drugs (ref. no) Yes	0.81	(0.30, 2.19)	—	—
Ever injected drugs (ref. no) Yes	0.84	(0.05, 13.70)	—	—
<b>STI and HIV testing history</b>				
Had an unusual anal discharge or ulcerations in last 12 months (ref. no) Yes	0.54	(0.13, 2.20)	—	—
Knows where to get an HIV test (ref. no) Yes	1.45	(0.81, 2.61)	2.00*	(1.10, 3.61)
Has had an HIV test in last 12 months (ref. no) Yes	0.37**	(0.17, 0.81)	0.32**	(0.13, 0.82)
<b>Prevalent infections:</b>				
HIV (ref. no) Yes	0.40	(0.07, 2.42)	—	—
Hepatitis C (ref. no) Yes	0.67	(0.15, 3.01)	—	—
Hepatitis B (ref. no) Yes	0.75	(0.25, 2.25)	—	—
Syphilis (ref. no) Yes	0.63	(0.22, 1.81)	—	—

OR = odds ratio; AOR = adjusted odds ratio; CI = confidence interval; STI = sexually transmitted infection

increase opportunities for the further transmission of HIV and other infections within this population. We expected to find more significant findings of inconsistent condom use associated with sexual behaviours, substance use and infections prevalence; however, this was not the case. Nevertheless, the finding that MSM who reported using a condom at last anal sex with a man were less likely to have casual male sex partners in the past six months may indicate that MSM in Moldova practiced protective behaviours (using condoms) with their non-paid higher-risk sexual partners.

We found that MSM in Chisinau and Balti are having sex with women and the majority of them use condoms with female partners inconsistently. Similarly, a study using numerous data sources conducted in Moldova in 2010 found that 33% of MSM had female partners.<sup>17</sup> Nevertheless, our survey did not reveal any significant associations of condom use and recent sex with a woman. High prevalence of sex with women is a common finding in other studies conducted

among MSM in numerous Central and Eastern European countries and may be a result of high stigmatization towards male-to-male sex in the region.<sup>18,19</sup> Efforts are needed to support policies that reduce discrimination and stigma towards MSM and measures to reduce barriers that put MSM and their female sexual partners at risk for HIV and other infections.

HIV prevalence among MSM was seven times higher (mean of 1.1%) than that found in the general population of Moldova, but was relatively low compared with MSM in many neighbouring countries such as Russia (3.4%), Ukraine (10.6%), Georgia (5.3%), Serbia (8.7%) and Poland (5.4%).<sup>20</sup> This survey also found a modest HCV prevalence (mean of 4.5%) – just below the overall HCV prevalence found in Moldova (4.9%) among blood donors (a so-called proxy for the general population)<sup>21</sup> and similar to several other countries in the region.<sup>22</sup> Moldova, as in other countries in Eastern Europe and Central Asia, is described as having an HIV epidemic

whereby HIV transmission among MSM occurs within a concentrated epidemic of injection drug users who practice high-risk injection behaviours.<sup>20</sup> This survey found that only 2.4% of MSM in Chisinau and none in Balti reported ever injecting drugs. Relatively low injection drug use has been also found among MSM in Ukraine (1.3–6%), Russia (3.9–4.3%) and Croatia (1.5%).<sup>15,18,23,24</sup> The risky injection practices and extremely high prevalence of HIV and HCV among the few MSM who do inject drugs in these countries provide an environment for further infection transmission to the greater MSM and general populations and should be monitored.<sup>20,25–28</sup>

No infections were associated with condom use at last anal sex. It would have been expected that MSM who did not use condoms would be more likely to have syphilis. However, no association was found in other regression models with condom use during anal sexual contacts with men ever, or in the last six months, or condom use with women ever, or in the past 12 months. These are lifetime syphilis findings and there is no information about when infection occurred. HBV prevalence was 5.7% among MSM in Chisinau and 3.2% in Balti, higher than the prevalence of the registered HBV chronic cases in the general population (<1%)<sup>29</sup> in Moldova but lower than that found in Bulgaria (6.7%), Croatia (17.9%) and Albania (17.6%).<sup>22</sup> As in Moldova, MSM in most countries are at higher risk for HBV than the general population due to high-risk sexual behaviours and inconsistent condom use.<sup>30,31</sup> In Moldova, vaccination for HBV is currently recommended to certain key populations, including MSM, resulting in a reduction of HBV incidence in the general public over the past decade.<sup>32,33</sup> However, despite the wide availability of HBV vaccines and national recommendations for vaccination of high risk groups in many countries, vaccinations among MSM are low because of non-disclosure of high-risk sexual activity to health-care providers, the lack of adherence to recommendations by health-care providers, incompleteness of the vaccination regimen by patients and insufficient outlets available to MSM to receive vaccinations.<sup>30,31,34–37</sup> Moldova will need innovative education and service strategies to encourage MSM to receive vaccinations for HBV.

MSM who used a condom at last anal sex with a man were more likely to know where to get an HIV test. This could indicate that these men have linkages to HIV educational services and understand the risk of HIV and unsafe sexual practices. However, MSM who used condoms were less likely to have had an HIV test in the previous 12 months, indicating that knowing where to get a test does not necessarily lead to having a test. HIV testing and counseling services in Moldova were established in late 2008 and have been scaled up to 69 VCT rooms provided through public health-care institutions throughout the country. Nevertheless, VCT services in Moldova mostly target the general population and offer no specific services to high-risk populations. The Moldova VCT Information System in 2011 reported that only 0.01% of those accessing HIV pretest counselling reported belonging to a high-risk population (LT, personal communication). Evidence of discrimination towards MSM by public health providers may account for the low numbers of MSM accessing VCT in Moldova.<sup>38,39</sup> In 2012, the National AIDS Center in Moldova initiated efforts to scale up VCT coverage of high-risk populations by delegating counsellors to harm reduction and HIV prevention sites and providing rapid tests in 11 facilities operated by non-governmental organizations serving these populations (LT, personal communication).

MSM in Chisinau, compared with Balti, had higher prevalence of all infections. One explanation for this finding is that the Chisinau sample was older than the Balti sample, thereby affording more opportunities (more years) for infection. MSM in Chisinau also reported having more commercial partners and less condom use at last anal sex with a man and with male regular and commercial partners and with female partners. Furthermore, in a highly stigmatized context, MSM across the country tend to concentrate in big urban areas, mostly Chisinau, the capital city, where it is easier to remain anonymous and to find sex partners.

This survey was subject to several limitations. Because behavioural data were self-reported, social desirability bias may have resulted in the over-reporting of socially desirable behaviours, such as condom use and under-reporting of socially undesirable behaviours, such as injection drug use. The sample in Balti is likely over-represented by younger people, which may have led to an under-representation of infection prevalence. We are unsure why sampling in Balti attracted such a young population given that the seeds were diversified in ages ranging from 19 to 55 years (mean: 33 years). More research is needed to explain these findings.

The samples were likely affected by the fact that so few recruitment waves resulted in seed dependency and by not reaching the calculated sample sizes resulting in low power for our analyses. The main reasons for the sample sizes not being reached were due to budget constraints and a time limit allotted for data collection. However, other factors for not attaining the calculated sample size discovered through ongoing formative research included erroneous rumours in Chisinau that people would be infected with HIV if they enrolled in the survey and in Balti that the survey would threaten some partnerships between MSM by providing a venue for MSM to meet new sexual partners. Nevertheless, the future use of RDS to sample this population should attempt to gather more recruitment waves in order to reduce seed dependence and allow ample time and a sufficient budget for the sample to reach calculated sample sizes. The aggregation of data from both cities for the regression analysis violates the RDS assumption that the sampled social network comprises one complete network component (10). Under this assumption, each of survey cities is a separate network component and as such, conclusions drawn from the regression analyses should not be interpreted as being representative of MSM in Moldova. The multivariate analysis that was conducted for this analysis utilized exported weights for the dependent variable (that is, condom use at last anal sex). However, standardized guidelines for multivariate analysis for RDS data are still under development and require validation.

A formative evaluation of HIV Prevention Programs, carried out in 2010, identifies low overall HIV prevention programme coverage for MSM, particularly among non-gay identified MSM, 'hidden' MSM, MSM with overlapping risk behaviours (e.g. injecting drug use and commercial sex), and among the female partners of MSM.<sup>39</sup> Given our findings that MSM have high sexual risk practices and low rates of HIV testing, HIV and other infection services provided to MSM in a friendly and accommodating environment, with well trained and sensitive staff, are urgently needed. This is the first attempt in Moldova to use RDS, a quasi-probability sampling method, to measure HIV and other infections and sexual risk among MSM, and is likely an improvement over past studies that used convenience sampling methods. These initial rounds of IBBS provide essential strategic evidence upon which to build

a comprehensive program to serve the needs of MSM in Moldova.

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