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# Condom use and HIV testing among adults in Switzerland: repeated national cross-sectional surveys 2007, 2012, and 2017

Diana Buitrago-Garcia<sup>1,2</sup>, Georgia Salanti<sup>1</sup> and Nicola Low<sup>1\*</sup>

## Abstract

**Background** Monitoring of HIV and sexually transmitted infection (STI) prevention is important for guiding national sexual health programmes for both the general population and key populations. The objectives of this study were to examine trends and patterns of condom use at last intercourse and lifetime HIV testing in 2007, 2012 and 2017 in Switzerland, and to explore factors associated with these behaviours in men and women with opposite-sex partners and with same sex partners.

**Methods** We analysed data from the 2007, 2012 and 2017 Swiss Health Survey. For each time point, outcome and population group, we conducted a descriptive analysis of weighted data and conducted multivariable logistic regression to obtain adjusted odds ratios (aOR) with 95% confidence intervals (CI) and compared outcomes between the timepoints.

**Results** In total, 46,320 people were interviewed: 21,847 men and 23,141 women, who reported having sex only with partners of the opposite sex, 633 men who reported sex with a male partner and 699 women who reported sex with a female partner. Among the three surveys the prevalence of condom did not change but varied from 22 to 26% of men and 15 to 21% in women with only opposite-sex partners (aOR men, 0.93, 95% CI 0.82, 1.06; women 0.98, 95% CI 0.86 to 1.11). In men with any same sex partner the prevalence of condom use was 40% in 2007, 33% in 2012 and 54% in 2017 (aOR 1.80, 95% CI 0.97, 3.34). In multivariable analysis, the factor most strongly associated with condom use was sex with an occasional partner at last intercourse. HIV testing ever increased across all three survey years in people with opposite sex partners: 2017 vs. 2007, aOR men with only opposite-sex partners 1.64 (95% CI 1.49, 1.82), women with only opposite-sex partners 1.67 (1.51, 1.85), men with any same sex partner 0.98 (0.49, 1.96), women with any same sex partner 1.31 (0.74, 2.30).

**Conclusions** Monitoring of condom use, and HIV testing should continue and contribute to the development of the national sexual health programme. Stronger promotion of condoms for people with opposite-sex partners might be needed, since overall condom use at last intercourse has not changed since 2007.

**Keywords** Condoms, HIV, Prevalence, Health surveys

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## Background

Monitoring of HIV and sexually transmitted infection (STI) prevention is important for guiding national sexual health strategies for both the general population and key populations [1], including men who have sex with men, who are disproportionately affected by HIV and other STIs [2]. Consistent condom use is an important and effective method for the prevention of many STIs, including HIV, although their effectiveness varies according to the infection [3, 4]. Testing for antibodies to HIV allows early identification of new HIV infections, which enables earlier access to antiretroviral therapy. A negative test for HIV can now allow access to pre-exposure prophylactic (PrEP) medication for people whose sexual lifestyle or practices increase the risk of acquiring HIV, and whose use has been increasing since 2015 [5, 6].

Surveys of nationally representative samples contribute to understanding changing patterns of sexual behaviours and preventive practices at the population level [7]. In the 1990 and 2000 British National Surveys of Sexual Attitudes and Lifestyles (Natsal), condom use in the past year reported by 16 to 44 year olds increased from 43 to 51% in men and from 31 to 39% in women [8]. In the United States of America (USA), around 20% of men and women aged 18 years and older reported condom use at last sexual intercourse with little change across biennial General Social Surveys from 1996 to 2008 [9]. Men who have sex with men report higher levels of condom use and HIV testing than men who have only opposite-sex partners [10, 11]. Few studies examine patterns of condom use and HIV testing in women with female partners as HIV risk is lower in this group and condom use is thought to be less relevant [12].

Condom use and HIV testing have been monitored as key indicators in the national strategy for the prevention of HIV and STIs in Switzerland since 1987 [13]. The Swiss Federal Office of Public Health incorporated evaluations into a system of behavioural surveillance, as recommended for countries with concentrated epidemics of HIV, in 2004 [14]. The objectives of this study were to examine patterns of condom use and HIV testing from 2007 to 2017 in Switzerland and to explore factors associated with these preventive behaviours in groups of people with opposite-sex partners and with same sex partners, using data from population-based surveys.

## Methods

### Study design

We analysed all three rounds of the Swiss Health Survey that included questions on condom use and HIV testing since 2007, when national monitoring of HIV and STI prevention was incorporated into the five-yearly Swiss Health Survey [15]. All surveys were conducted before marriage between same-sex partners became legal, in

2022. The Swiss Health Survey is a cross-sectional survey conducted every five years since 1992, with a representative sample of the permanent resident population aged 15 years and older who speak German, French, or Italian [15]. People living in an institution (hospital, nursing home, prison, convent or monastery) or resident in Switzerland for 3 months or fewer at the time of the survey were not invited. The Swiss Federal Statistical Office used the sampling frame for personal and household surveys, which is based on data from cantonal and municipal registers of residents and supplemented quarterly with information from telephone service providers. The sample is generated for each survey through stratified, multistage random sampling in each canton. The response rate for the telephonic survey was 66% in 2007, 53% in 2012 and 51% in 2017 [15]. A sample weight that compensates for non-response is assigned to each observation, according to region, household size, age, sex and nationality.

### Study groups and variables

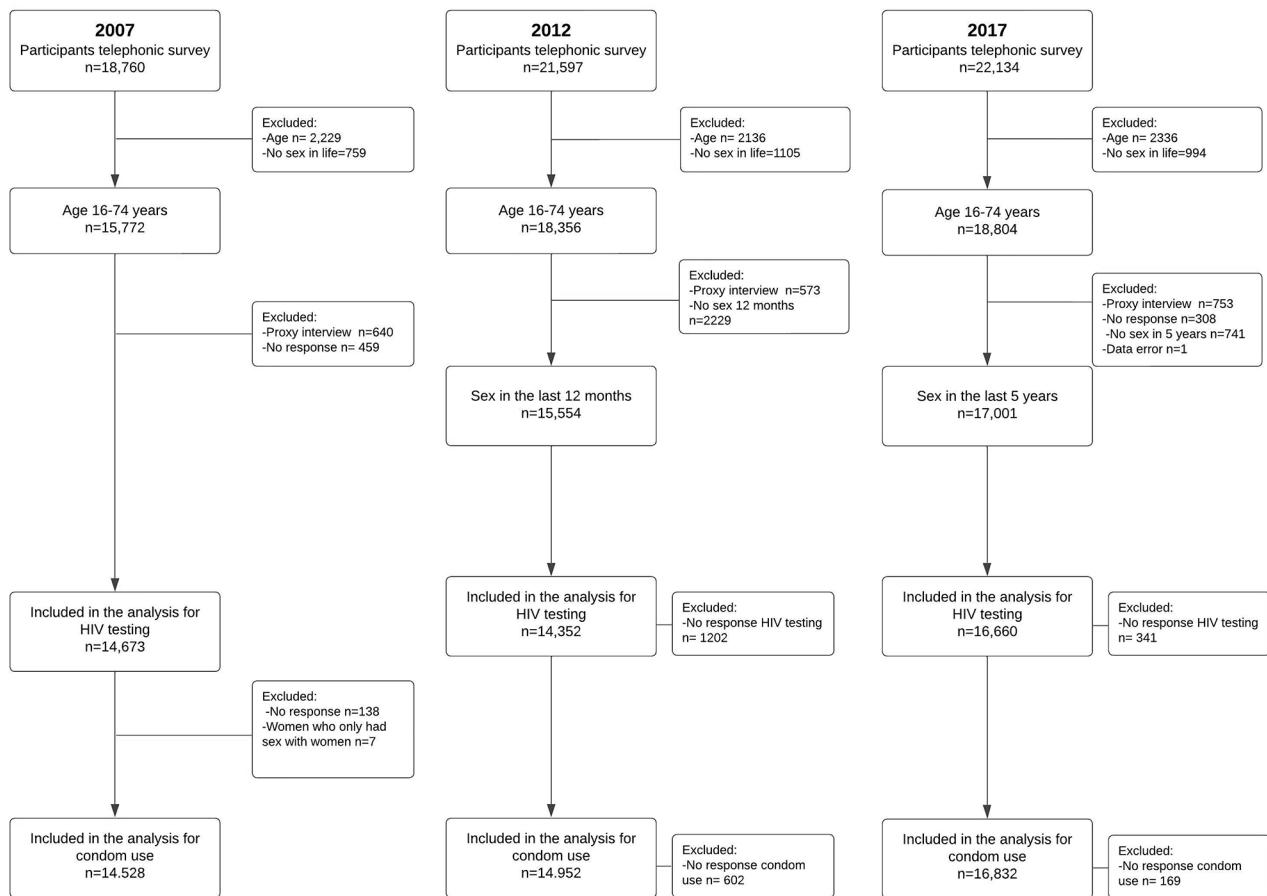
We considered respondents in four sexual behaviour groups, using information available in all three surveys. We stratified respondents by sex (men and women) and by the reported sex of their sexual partners: men with only female partners, women with only male partners, men with any male partner, and women with any female partner. The questions about sexual partners referred to the sexual lifetime for the surveys in 2007 and 2012 and the last five years for the 2017 survey. There was no category for people with a non-binary gender identity. A separate question about sexual orientation was asked for the first time in 2017.

### Outcome variables

We examined two outcomes, condom use at last sexual intercourse and ever having had an HIV test. The questions about the outcomes were asked by an interviewer by telephone to participants between 16 and 74 years old and additional filtering questions determined the group of eligible respondents for each question (Fig. 1). Some filtering questions differed between surveys (Table S1). For condom use, the question asked, "Did you use a male condom the last time you had sex?" For testing for HIV, the question asked, "How many times have you taken an AIDS test?" and "When was the last time?"

### Exposure variables

We selected variables from the questionnaire, which we considered *a priori* to be relevant to condom use and HIV testing, in the following categories: demographic (age), social and economic (region of residence, education level, personal income and marital status); sexual behaviours (age at first sexual intercourse, frequency of sexual intercourse during the last 12 months, number of



**Fig. 1** Flowchart of inclusions and exclusions for respondents to questions about condom use and HIV testing

partners during the last 12 months and if the partner was stable, occasional or a sex worker); and other behaviours (consumption of alcohol, tobacco, cannabis, and other illicit drugs, heroin, cocaine, or ecstasy).

#### Statistical analysis

We used the *survey* [16] package in R (version 3.5.1) to incorporate the weightings provided by the Swiss Federal Statistical Office [17] and to generate results that are representative of the Swiss population. For each survey and outcome, we conducted a descriptive analysis of the weighted data and reported percentages (with 95% confidence intervals) for each categorical exposure variable, the median and interquartile range (IQR) for continuous variables and unadjusted odds ratios (OR, 95% CI) for associations between each outcome and exposure.

We then conducted multivariable logistic regression analyses to obtain adjusted odds ratios (aOR, 95% CI) for the associations between each outcome and exposure variable. We added survey year as a variable to examine evidence of a change over time. In the multivariable analyses of condom use, we examine the change only between the 2012 and 2017 surveys because in 2007 the question

about type of partner (stable, occasional and sex worker) was not asked and this exposure was considered relevant for condom use. People who had never used a condom were not asked about the use of condoms at last sexual intercourse. For men and women with only opposite-sex partners, the multivariable model includes all exposure variables and the year of the survey. For people with same sex partners, the regression model included only survey year, age, number of sex partners and type of partner in the multivariable model, owing to the small sample sizes. We did a post hoc analysis and included marital status in the multivariable model assessing condom use in men reporting having sex with any same-sex partner. We excluded observations with missing data from the analyses.

For each outcome, we report findings separately for the four sexual behaviour groups: men and women reporting sex only with opposite partners and men and women reporting having sex with any same-sex partner. For analyses of HIV testing, we include all three survey years in multivariable analyses because eligibility criteria for responding to the question were similar.

In the **Results** section, we include one table that shows the proportion of people who reported using a condom at last sexual intercourse and HIV testing for each survey year, by sexual behaviour group. Each figure summarises the results from the univariable and multivariable logistic regression analyses, for men and women reporting only opposite sex partners and men reporting same-sex partners. For each outcome and group, we refer to the corresponding tables in the additional online file, which provide the weighted and unweighted denominators, proportions, and the numerical results of the univariable and multivariable regression analysis results. All results for women reporting same sex partners are in the additional file.

## Results

In the three surveys, a total of 46,320 people were interviewed by telephone, comprising 21,847 men and 23,141 women who reported having only sex partners of the opposite sex, 633 men who reported any male sex partner and 699 women who reported any female sex partner (Fig. 1, Table S2).

Table 1 summarises the overall weighted denominators and prevalence for each outcome and each study group. The proportion of respondents reporting condom use at last sexual intercourse appeared similar in each survey year in men (22 to 26%) and women (15 to 21%) with only opposite-sex partners; women reporting any same sex partner (most of whom had had sex with at least one man, 22 to 27%); for men reporting any same sex partner reporting condom use at last sexual intercourse increased across surveys (33 to 54%). Proportions of respondents reporting ever having had an HIV test appeared to increase over time: men (32 to 45%) and women (35 to 51%) with only opposite-sex partners; men (72 to 83%) and women (61 to 70%) reporting any same sex partner.

### Condom use at last sexual intercourse

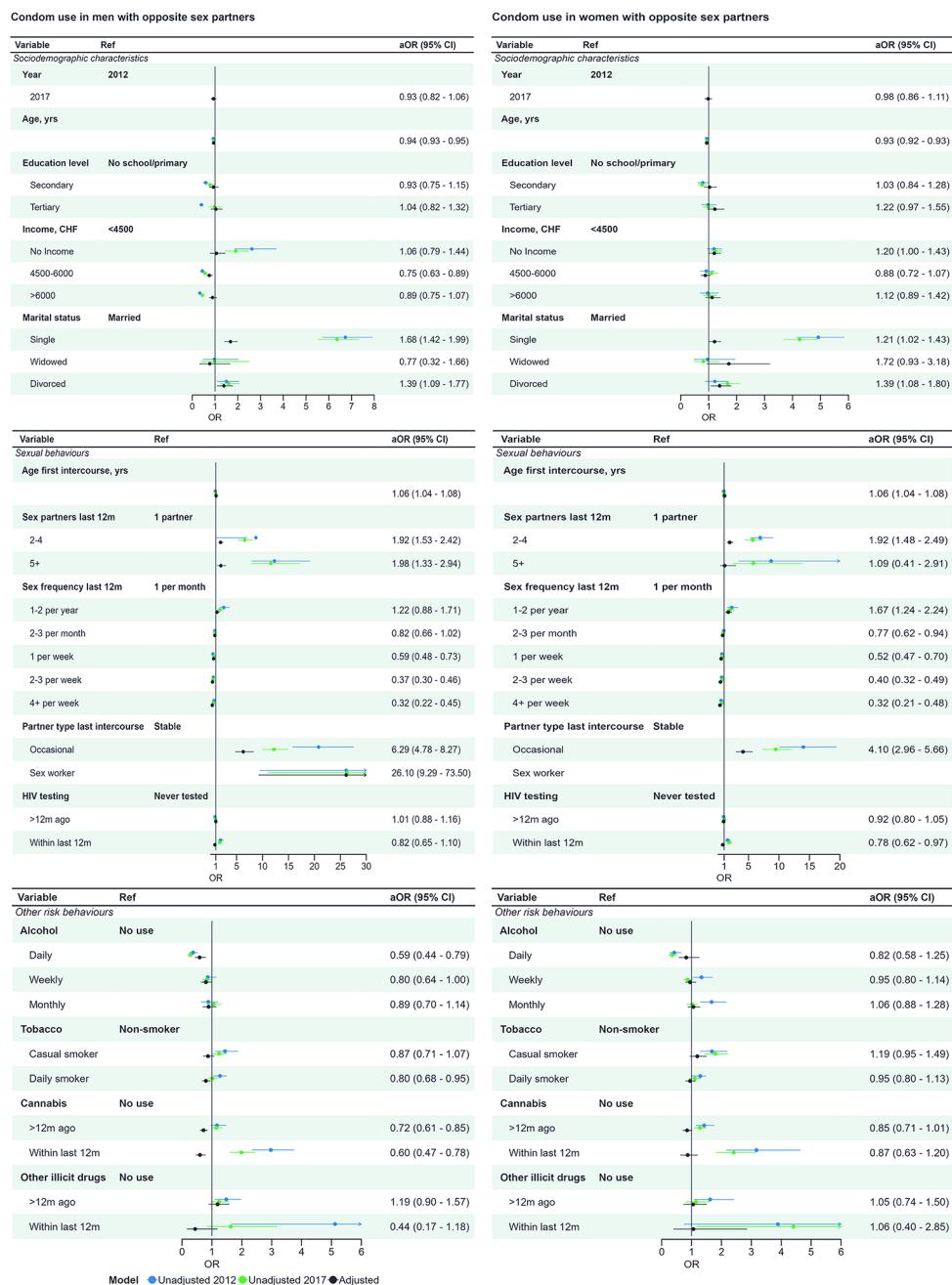
#### *Men and women reporting only opposite-sex partners*

In all survey years, condom use was highest in the age group 16–24 years for both men (from 64 to 67% in the three survey years) and women (43 to 48%), decreasing with increasing age, and higher among single (46 to 48% of men and 36 to 38% of women) than married, widowed, or divorced people, with little regional variability (Tables S3–S5). Among men, condom use was reported most frequently by those who did not attend school or who only completed primary school and by those in the lowest income category (46 to 58% of those with no monthly income). Among women, reported condom use was similar according to education and income in all years. Condom use at last sexual intercourse was consistently higher in both women and men who reported higher numbers of sexual partners across all survey years. Among those reporting 5 or more partners in the last 12 months, 63 to 73% of men and 40 to 61% of women reported condom use, compared with < 20% in people reporting 1 partner in the last 12 months. In 2012 and 2017 (question not asked in 2007), those reporting an occasional partner reported higher levels of condom use with that partner (68 to 81%) than those with a stable partner (≤ 20%). The pattern of condom use according to age at first sexual intercourse was not consistent across survey years and did not vary substantially according to alcohol and tobacco consumption but was higher in current than non-current or never users of cannabis and other illicit drugs. People who had ever tested for HIV were slightly more likely than those who had never tested for HIV to report using a condom (results for 2007, Table S3, S4 and for 2012 and 2017, Table S3, S5). Comparing responses in 2017 with 2012 in multivariable analysis, there was no change in reported condom use at last sexual intercourse in either men (aOR 0.93, 95% CI 0.82 to 1.06) or women (aOR 0.98, 95% CI 0.86 to 1.11) (Fig. 2, Table S5). The strength of associations

**Table 1** Prevalence of condom use at last sexual intercourse and lifetime HIV testing in Switzerland

Survey year <sup>a</sup>	2007		2012		2017	
	Denominator N weighted	Prevalence % (95% CI)	Denominator N weighted	Prevalence % (95% CI)	Denominator N weighted	Prevalence % (95% CI)
<b>Condom use at last sexual intercourse<sup>b</sup></b>						
Men, only female partners	2,299,110	22 (21–23)	2,427,588	24 (22–25)	2,724,669	26 (25–28)
Women, only male partners	2,311,227	15 (15–17)	2,132,003	18 (17–19)	2,557,958	21 (20–22)
Men, any male partner	70,271	40 (31–49)	84,238	33 (26–41)	76,438	54 (46–63)
Women, any female partner <sup>c</sup>	66,759	22 (15–29)	96,257	27 (21–33)	69,018	25 (18–33)
<b>HIV testing ever<sup>b</sup></b>						
Men, only female partners	2,237,900	32 (30–33)	2,313,010	42 (40–43)	2,702,130	45 (44–46)
Women, only male partners	2,289,504	35 (34–37)	2,049,462	46 (45–48)	2,529,129	51 (50–53)
Men, any male partner	64,684	72 (64–80)	81,464	80 (74–86)	74,070	83 (77–89)
Women, any female partner	67,259	61 (53–69)	92,734	70 (63–77)	69,018	69 (60–77)

a. Unweighted denominators are reported in the supplementary tables (Additional file 1); b. Overall denominators for condom use and HIV testing differ because eligibility criteria for answering each question differed; c. In 2007, women who reported only female sex partners were not asked about condom use (n=7)



**Fig. 2** Condom use at last intercourse in people who report have sex with opposite sex partners, logistic regression estimates from univariable and multivariable analysis. **Legend:** The forest plots show associations between condom use and (top) demographic variables, (middle) sexual behaviour and (bottom) substance use. Unadjusted and adjusted associations are displayed graphically. The right-hand column shows the adjusted aOR (95% CI) from the multivariable model, which includes the variables from all three panels and region of residence. The multivariable model only includes 2012 and 2017 because the denominator for 2007 excluded people who had never used a condom. Unadjusted OR (95% CI) are available in the supplementary material. Other illicit drugs: Combines use of ecstasy, cocaine, or heroin

with most exposure variables was attenuated, except for age (for each year of increase in men, aOR 0.94, 95% CI 0.93, 0.95 and women, aOR 0.93, 95% CI 0.92, 0.93) and sex with an occasional rather than a stable partner at last sexual intercourse (aOR men 6.29, 95% CI 4.78, 8.27; aOR women 4.10, 95% CI 2.96, 5.66) remained most strongly

associated with condom use. Amongst men whose last sexual partner was a sex worker, the adjusted odds of condom use were 26.1 (95% CI 9.29, 73.5) times higher than for use with a stable partner. (Results for 2007, Tables S3-S4)

### **Men reporting any same sex partner**

In all survey years, condom use at last sexual intercourse was >80% in 16 to 24 year olds, decreasing with the age of the respondent (Tables S6-S7). The pattern of condom use according to other sociodemographic factors was similar to that in men reporting only opposite-sex partners. Among men reporting 5 or more partners in the last 12 months, 64% in 2007, 84% in 2012 and 86% in 2017 reported using a condom at last sexual intercourse, compared with 18 to 31% of those reporting 1 partner. In 2012 and 2017, reported condom use was higher with an occasional (74% and 83%, respectively) than a stable partner (23% and 33%). Reported condom use at last sex was most common amongst men who had had a test for HIV in the 12 months before the survey, 61% in 2007, 58% in 2012 and 63% in 2017, and amongst those reporting current alcohol, tobacco, cannabis or other illicit drug use.

The multivariable regression model compared survey years 2012 and 2017 (Fig. 3, Table S7). On average, the use of condoms increased (aOR 1.80), after controlling for age, number of sexual partners and type of sexual partner. The confidence interval includes values compatible both with no increase and an important increase (CI 0.97, 3.34,  $p=0.06$ ). In the post hoc multivariable model, the results were similar when marital status was included (aOR 1.64 95% CI 0.83–3.24  $p=0.15$ ). In these two multivariable models, condom use remained associated with higher numbers of sexual partners and for sex with occasional and sex worker partners (aORs 4.8 or higher, compared with reference groups, unadjusted ORs Fig. 3, Table S7-S8).

### **Women reporting any same sex partner**

In the group of women who reported any female partner, most reported that they had also had male sex partners (Table S2) and patterns of condom use at last sexual intercourse were similar to those for women with only male partners (Tables S4, S5, S9).

### **Testing for HIV Infection**

#### **Men and women reporting only opposite-sex partners**

When the lifetime prevalence of having had at least one test for HIV was assessed in men and women reporting only opposite-sex partners, both men and women, respondents in age groups 25 to 44 years were most likely to report ever having had a test for HIV (Tables S10-S13). In the youngest age group, the proportion reporting an HIV test increased considerably in men (20% in 2007, 40% in 2017) but less in women (33% in 2007, 35% in 2017). The highest levels of lifetime HIV testing were reported by those with the highest level of education (2017, 52% of men, 64% of women) and those with the highest personal income (2017, 52% of men, 61% of

women). People who were divorced (2017, 61% of men, 66% of women) and who reported 5 or more partners in the last 12 months (2017, 57% of men, 74% of women) also reported high levels of having had an HIV test. People who reported use of cannabis (in 2017, 58% of men, 70% of women) and of other illicit drugs (in 2017 66% of men, 83% of women) were more likely than non-users to have had an HIV test.

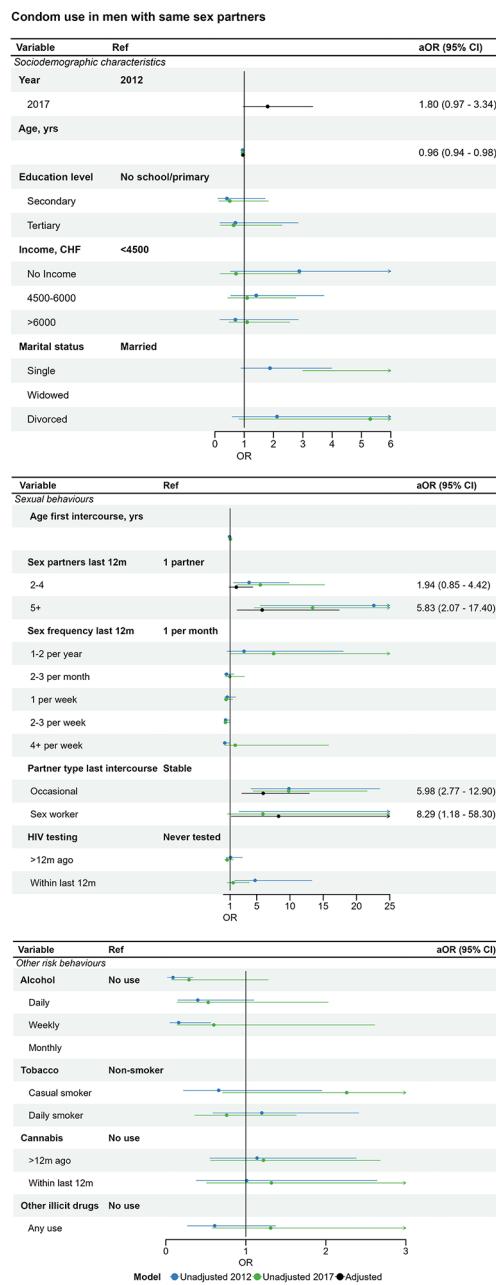
Multivariable analysis showed that lifetime HIV testing increased across all survey years; aOR between 2017 and 2007 was 1.64 (95% CI 1.49, 1.82) for men and 1.67 (1.51, 1.85) for women (Fig. 4, Tables S10-S11). After adjustment for survey year and all other variables examined, strong associations with ever testing for HIV remained for those with tertiary education vs. no, or primary school only (aOR men 2.43, 95% CI 2.06, 2.86, women 3.35, 95% CI 2.87, 3.92), being divorced vs. married (aOR men 2.46, 95% CI 2.10, 2.88, women 2.33, 95% CI 2.01, 2.69) (unadjusted ORs, Table S10-S11). The strength of associations with drug use was attenuated for use of illicit drugs vs. no use for women (aOR 2.98, 95% CI 2.20, 4.02) and men (aOR 1.72 CI 1.43, 2.06).

### **Men reporting any same sex partner**

Most men with any male sex partner reported ever having had an HIV test, with 83% (95% CI 77, 89%) in 2017 (Table 1, Tables S14-S15). Among those reporting ever having had an HIV test the highest proportions were aged 25–44 years (Table S15). Men in the oldest age group (65 to 74 years) were least likely to have been tested for HIV. In all survey years, men reporting 5 or more partners in the last year had high levels of HIV testing. For other variables, patterns of lifetime HIV testing were inconsistent. In all survey years, those reporting any use of illicit drugs were more likely than non-users to have tested for HIV. Across survey years, there was no increase in the lifetime prevalence of HIV testing (2017 vs. 2007, aOR 0.98, 95% CI 0.49, 1.96). The proportions reporting an HIV test in the last 12 months increased from 22% (95% CI 15%, 30%) in 2007 to 30% (14%, 38%) in 2012 and 39% (30%, 47%) in 2017 (Table S13). The factors associated with having had an HIV test in the last year were similar to those associated with ever having had an HIV test (Fig. 5, Table S15).

### **Women reporting any same sex partner**

The proportions of women with any female sex partner reporting ever having had an HIV test appeared somewhat higher (61% in 2007, 70% in 2012 and 69% in 2017) than amongst those reporting only male sex partners (35% in 2007, 46 in 2012 and 51% in 2017) (Tables S14, S16). There were few consistent patterns according to sociodemographic and behavioural variables. In the



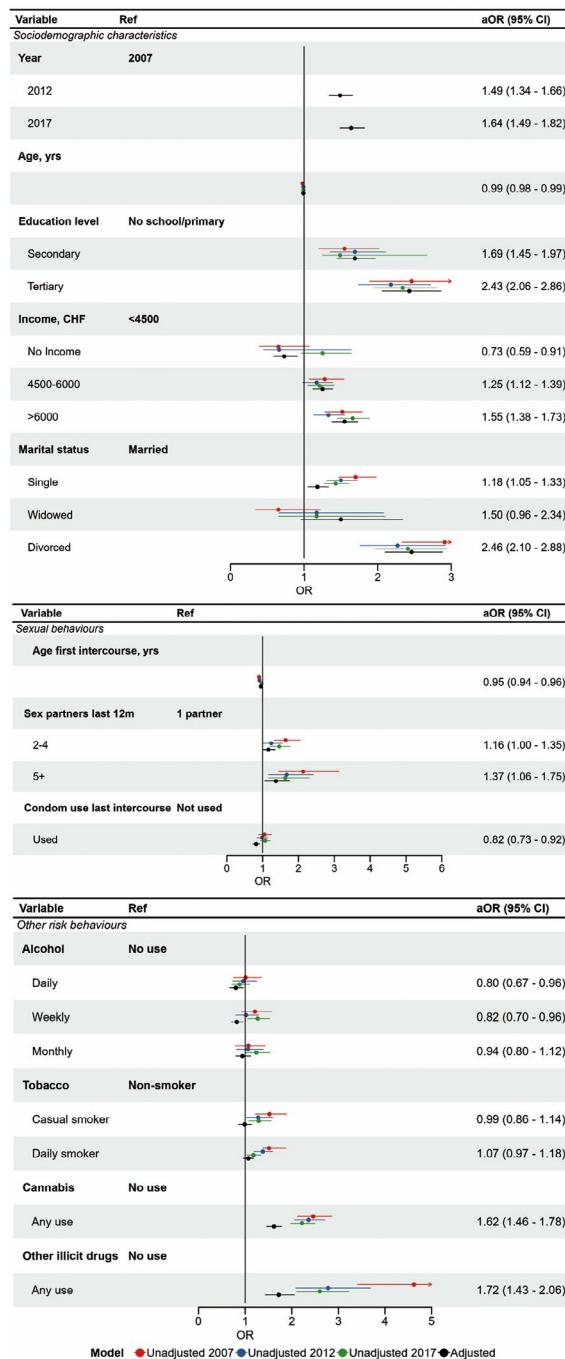
**Fig. 3** Condom use at last intercourse in men who report sex with men, logistic regression estimates from univariable and multivariable analysis. **Legend:** The forest plots show associations between condom use and (top) demographic variables, (middle) sexual behaviour and (bottom) substance use. Unadjusted and adjusted associations are displayed graphically. The right-hand column shows the adjusted aOR (95% CI) from the multivariable model, which includes age, number of sex partners and type of partner. The multivariable model only includes 2012 and 2017 because the denominator for 2007 excluded men who had never used a condom. Unadjusted OR (95% CI) are available in the supplementary material

multivariable model, there was no strong evidence of an increase across survey years but women reporting higher numbers of sex partners in the last 12 months were most likely to have had an HIV test (5 or more vs. 1 partner, aOR 4.65, 95% CI 1.02, 21.1) (Table S16).

## Discussion

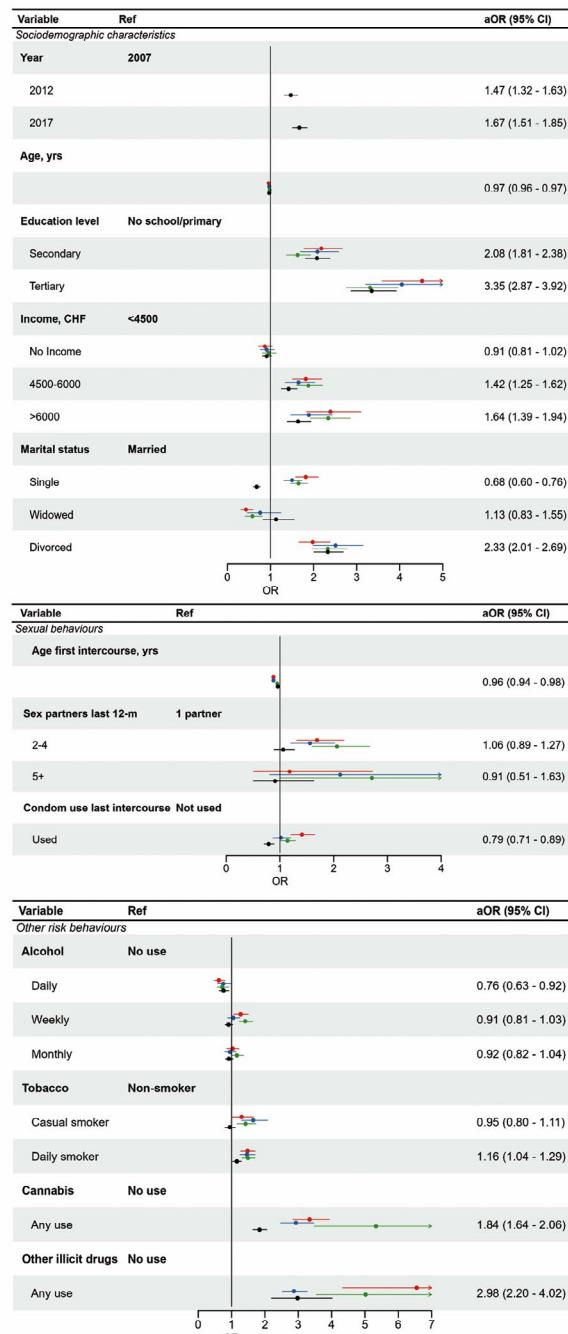
About 1 in 5 men and 1 in 4 women who reported only partners of the opposite sex reported using a condom at last sexual intercourse, with no change from 2012 to 2017. Sex with an occasional rather than a stable partner at last intercourse was the factor most strongly associated with condom use in multivariable analysis. About

## HIV testing in men with opposite sex partners



Model: Unadjusted 2007 (red), Unadjusted 2012 (blue), Unadjusted 2017 (green), Adjusted (black)

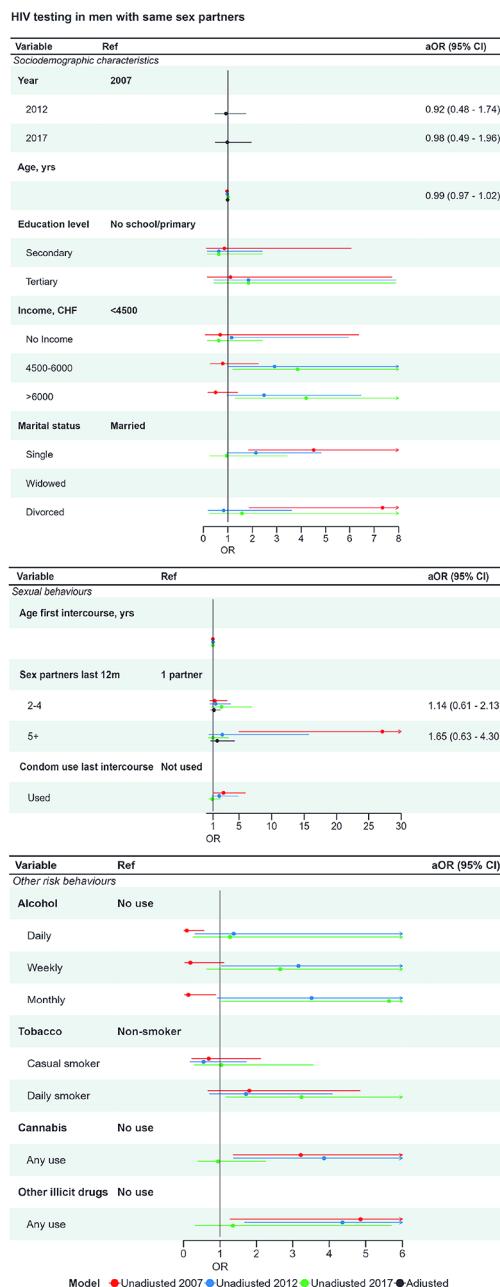
## HIV testing in women with opposite sex partners



**Fig. 4** HIV testing in people who report sex with opposite sex partners, logistic regression estimates from univariable and multivariable analysis. **Legend:** The forest plots show associations between condom use and (top) demographic variables, (middle) sexual behaviour and (bottom) substance use. Unadjusted and adjusted associations are displayed graphically. The right-hand column shows the adjusted aOR (95% CI) from the multivariable model, which includes all variables in the table and region of residence

1 in 3 to 1 in 2 men who reported any same sex partner said they used a condom at last intercourse with some evidence of an increase from 2012 to 2017 (aOR 1.80, 95% CI 0.97, 3.34). In multivariable analysis, both younger age and higher numbers of sex partners in the last 12 months were associated with condom use. The

lifetime prevalence of HIV testing increased from about 1 in 3 to about 1 in 2 from 2007 to 2017 in men and women reporting only partners of the opposite sex. Higher level of education and being divorced were the factors most strongly associated with HIV testing in multivariable analysis. Among men reporting any same sex partner, by



**Fig. 5** HIV testing in men who report sex with men, logistic regression estimates from univariable and multivariable analysis. **Legend:** The forest plots show associations between condom use and (top) demographic variables, (middle) sexual behaviour and (bottom) substance use. Unadjusted and adjusted associations are displayed graphically. The right-hand column shows the adjusted aOR (95% CI) from the multivariable model *includes year, age and number of sex partners*. Unadjusted OR (95% CI) are available in the supplementary material

2017 more than half reported use of a condom use at last intercourse and more than 4 in 5 had ever had an HIV test. Higher numbers of sex partners remained associated with HIV testing in multivariable analysis. Among women who reported any same sex partner, lifetime prevalence of HIV testing was higher than for women with only opposite-sex partners.

### Strengths and limitations

A strength of this study is that random sampling allows monitoring of condom use and HIV testing amongst a representative population sample that includes men and women who have same sex partners. Surveys among sexual minority groups are usually conducted using convenience sampling methods, which can result in selection biases that tend to overestimate the prevalence

of behaviours associated with HIV and STIs [18]. The small numbers of respondents with same sex partners in a general population survey does not, however, allow detailed stratification of a heterogeneous group according to behaviours and do not allow detailed analysis of the different contexts of, or factors mediating changes in condom use over time. Another strength is that we analysed three consecutive surveys although we could only examine changes over time when eligibility criteria for answering the question were similar. A limitation related to this aspect was the question about HIV testing, which in 2017 did not distinguish between testing performed in relation to blood donation and testing for HIV. We also report data disaggregated by sex and note a small but consistent excess of men who report condom use, even when restricting analyses to people who only report partners of the opposite sex. Since it is the man who wears the condom, this difference might indicate that some women do not consider that they themselves used a condom. A potential limitation of the Swiss Health Survey is that questions were asked during a telephone interview. Direct questioning can result in under-reporting of sensitive behaviours and computer-assisted or written questionnaires are often preferred [7, 8, 12]. If numbers of sexual partners were under-reported and condom use over-reported, odds ratios for the association between condom use and higher sexual partners in the Swiss Health Survey might be over-estimated.

#### Interpretation of findings in context of other studies

Direct comparisons of condom use and HIV testing in different national surveys are challenging because definitions of the outcome, the study population and timing of surveys differ in published reports. Overall, condom use at last sexual intercourse in Swiss Health Survey respondents (24% in men and 18% in women reporting only opposite-sex partners aged 16 to 74 years in 2012) appears comparable to the USA General Social Survey (20% of all adults aged 18 years and older from 1996 to 2008) and did not increase over time in either country [9]. In the United States, the National Survey of Family Growth shows similar trends among men and women between 15 and 44 years. Condom was used at last sexual intercourse in women and men between 15 and 24 years (53%) and was higher in men and women with no high-school or general education diploma (75.4%). Although, the time frames for asking the questions on condom use differ among surveys, we observed a similar pattern [19]. In the German Health and Sexuality Survey, the use of a computer-assisted self-interview might have contributed to higher reported use of condoms at last intercourse in single adults aged 18 to 75 years (60% of men, 55% of women in 2018) than in the Swiss Health Survey (48% of men, 38% of women aged 16 to 74 years in 2017) [20].

Despite using telephone interviews rather than computer-assisted surveys, the reported prevalence of lifetime HIV testing was higher among adults aged 16 to 74 years in Switzerland (42% of men and 46% of women reporting only opposite-sex partners, 80% of men with any same sex partner in 2012) than in Britain (18% of all men, 23% of all women [10] and 60% of men with any male partner [18] in Natsal 3, conducted from 2010 to 2012).

An advantage of this analysis of data from the Swiss Health Survey was the inclusion of both condom use and HIV testing in the same study. Factors associated with lifetime HIV testing in the Swiss Health Survey in multivariable analysis were more often socioeconomic, whereas sexual behaviours remained associated with condom use. For respondents with only opposite-sex partners, neither condom use at last intercourse nor HIV testing in the last year increased over time. Patterns of condom use in multivariable analyses in the Swiss Health Survey appear broadly consistent with other countries, being more common in the youngest adults, those who are single, with higher numbers of sex partners and with a non-stable partner [7, 8, 12, 20]. Use of illicit drugs was also associated with HIV testing, which might reflect the higher risk of acquiring HIV through shared injection equipment.

Our study provides useful findings about the sexual health of a nationally representative sample of people with same-sex partners. Among men, there was evidence of an increase over time in condom use at last intercourse, although the confidence interval around the estimate includes values compatible with no increase. The proportion who had an HIV test in the last 12 months increased over time [21]. Among women who reported any female sex partner, we found similar levels of reported condom use at last intercourse as among women reporting only opposite-sex partners, showing that women with same-sex partners can also be at risk of HIV and STIs. This finding results from the decision to group together the small total number of respondents with same-sex partners (Table S2). Most women who reported any same-sex partners also reported having had one or more partners of the opposite sex, so the reported condom use is assumed to have been with a man. Amongst studies that report on condom use by women with same-sex partners, most stratify by self-defined sexual orientation [11, 12]. In the Swiss Health Survey, we could not compare survey responses over time according to sexual orientation because this question was first asked in 2017.

#### Conclusions

This study provides data about preventive behaviours, which can be used during the development of the national sexual health programme in Switzerland [22]

and for comparison of outcomes over time and with other countries. Changes over time in levels of condom use and uptake of HIV testing can indicate a need for intensified or targeted prevention information or health promotion, particularly among key population groups at high risk of acquiring or transmitting HIV or other STIs. The number of new diagnoses of HIV infection in Switzerland and other countries in which PrEP use is established is declining [23], which is consistent with an increase in recent HIV testing in the last 12 months among men seeking PrEP [5]. Further research is warranted to investigate reasons for HIV testing among men with same-sex partners. Reported bacterial STIs in Switzerland are increasing, mostly among men who have sex with men, but also among men and women recorded as heterosexual. Our results show that in 2017 81% of 16 to 24 year old men with same-sex partners reported using a condom at last sexual intercourse. These results are encouraging because the increasing use of PrEP has been associated with an increase in both condomless anal intercourse and increases in reported diagnoses of STIs [23, 24]. Fieldwork for a new round of the Swiss Health Survey took place in 2022. Monitoring of levels of condom use and HIV testing need to continue and changes according to sexual orientation will be possible in future. Although condom use is reported more frequently by people reporting higher numbers of sexual partners, stronger promotion of condoms for people with opposite-sex partners might be needed, since condom use at last intercourse has not changed since 2007.

#### Abbreviations

STI	sexually transmitted infection
CI	Confidence Interval
aOR	adjusted odds ratios
IQR	interquartile range
CHF	Swiss Francs
yrs	years
PrEP	pre-exposure prophylactic
Natsal	National Surveys of Sexual Attitudes and Lifestyles

#### Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12889-023-17056-x>.

Supplementary Material 1

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#### Authors' contributions

Conceptualisation: NL. Methodology and data curation: DB, NL, GS. Analysis: DB, NL, GS. Writing original draft: DB, NL. Writing review and editing: DB, NL, GS. All authors reviewed the manuscript.

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#### Data Availability

The data supporting the conclusions of this study are available from the Swiss Federal Statistical Office, but restrictions apply to the availability of these data, which were used under license for the current study, and they are not publicly available. (<https://www.bfs.admin.ch/bfs/de/home/statistiken/gesundheit/erhebungen/sgb.html>)

#### Declarations

##### Ethics approval and consent to participate

This study used secondary data and did not require approval from a research ethics committee. The data were collected in accordance with the Swiss Federal Statistics Act and were anonymised before sharing. Written informed consent was waived according to the data collection, processing and storage regulated by the Ordinance on the Conduct of Federal Statistical Surveys of June 30, 1993 (SR 431.012.1) and the Ordinance on the Federal Census of December 19, 2008 (SR 431.112.1). All analyses were carried out in compliance with relevant guidelines.

##### Consent for publication

Not applicable.

##### Competing interests

The authors declare that they have no competing interests.

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