

# Changes in sexually transmitted infections-related sexual risk-taking among young Croatian adults: a 2005-2021 three-wave population-based study

Ivan Landripet<sup>1</sup>, Ivana Božičević<sup>2</sup>, Valerio Baćak<sup>3</sup>, Aleksandar Štulhofer<sup>1</sup>

<sup>1</sup>Department of Sociology, Faculty of Humanities and Social Sciences, University of Zagreb, Zagreb, Croatia

<sup>2</sup>School of Medicine, University of Zagreb, Zagreb, Croatia

<sup>3</sup>School of Criminal Justice, Rutgers University, Newark, New Jersey, USA

**Aim** To assess the prevalence and dynamics of risky sexual behaviors among Croatian emerging adults in the 2005-2021 period.

**Methods** Three surveys were conducted on large-scale national samples of young adults aged 18-24 in 2005 (N=1092) and 18-25 in 2010 and 2021 (N=1005 and N=1210, respectively). The 2005 and 2010 studies were conducted with face-to-face interviews on stratified probabilistic samples. The 2021 study was conducted by computer-assisted web-interviewing on a quota-based random sample from the largest national online panel.

**Results** Compared with 2005 and 2010, the age at coital debut increased for both genders in 2021 (by a median of one year, to 18 years, and by a mean of half a year, to 17.5 years, in men and to 17.9 in women). In the 2005-2021 period, condom use increased by about 15% both at first intercourse (to 80%) and in consistent use (to 40% in women and 50% in men). When we controlled for basic socio-demographics, Cox and logistic regressions indicated that, for both genders, in 2005 and 2010 compared with 2021, the risks/odds were significantly higher for reporting an earlier sexual debut (adjusted hazard ratio 1.25-1.37), multiple sexual partners (adjusted odds ratio [AOR] 1.62-3.31), and concurrent relationships (AOR 3.36-4.64), while the odds were lower for condom use at first sexual intercourse (AOR 0.24-0.46) and consistently (AOR 0.51-0.64).

**Conclusion** Risky sexual behaviors decreased in the 2021 survey compared with the previous two waves, in both genders. Nonetheless, sexual risk-taking is still frequent among young Croatian adults. The introduction of sexuality education and other national-level public health interventions to reduce sexual risk-taking thus remains a public health imperative.

Received: November 7, 2022

Accepted: June 14, 2023

## Correspondence to

Ivan Landripet  
Department of Sociology  
Faculty of Humanities and Social Sciences  
Ivana Lučića 3  
10000 Zagreb, Croatia  
[ilandrip@ffzg.unizg.hr](mailto:ilandrip@ffzg.unizg.hr)

Sexual risk-taking refers to behaviors that can adversely affect reproductive, sexual, and psychological health, leading to sexually transmitted infections (STI), sexual victimization, unwanted pregnancies, and reduced well-being. Risky sexual behaviors typically include coital debut at an early age, unprotected sexual activities, having multiple sexual partners, and engaging in concurrent sexual relationships (1-3). Early sexual debut and having multiple partners are consistently associated with unprotected sex and an increased risk of acquiring an STI (4-7).

Globally, the highest age-specific prevalence of risky sexual behavior is found in adolescents and emerging adults, with condomless sexual intercourse ranking second among health-related mortality risks in young women and men (8). Transition to adulthood is a period of experimenting with various sexual practices and changing sexual partners (9). At the same time, young people often lack knowledge of sexual health, emotional and cognitive skills necessary for responsible decision-making, and communication competencies required for negotiating safe sex (9,10). The patterns of sexual risk-taking acquired at young age continue to affect sexual behaviors in later life, adding to the cumulative risk of STI (11).

Over the past 10-15 years, sexual activity and early sexual debut have somewhat decreased among young people internationally (12-19), albeit with significant socio-cultural variations. Nonetheless, the prevalence of STI, unplanned pregnancies, and abortions remained high or even increased among youth (5,10,12,13,17,20). In Europe, sexually active 15-24-year-olds bear the highest risk of *Chlamydia trachomatis* infection compared with all other age groups, with nearly half of new cases being observed in that group (21). Similarly, nearly 50% of all newly contracted common STI in the United States are found among adolescents and young adults (22).

In Croatia, findings from a sole national repeated cross-sectional study on sexual behavior among young people (conducted in 2005 and 2010) revealed substantial and stable levels of risky sexual behaviors (23-25). In particular, persistently low levels of consistent condom use (about 30%) were observed; one third of participants reported delayed condom application and one quarter reported concurrent sexual partners. At the same time, more than 80% of participants from both study waves believed that they were at low or no risk of contracting STI. More recently, poor knowledge of risks to sexual and reproductive health was reported among Croatian senior high-school students (26), as well as a high prevalence of human papillomavirus

among young women (27). This hardly comes as a surprise due to the absence of school-based sexual education in the country – which remains a highly politicized issue – and the lack of organized national-level prevention efforts to reduce sexual risks (28-30).

Systematic monitoring of sexual behavior in Croatian youth is a public health imperative considering the levels of sexual risk-taking, the prevalence of common STI, and the lack of education in responsible sexual behavior. This article presents findings from the third wave of the national study on sexuality in young people in Croatia conducted in 2021. The study aimed to assess the current prevalence of risky sexual behaviors in emerging adults and their dynamics over the 2005-2021 period with the purpose of informing evidence-based national policy planning and public health interventions focused on young people's sexual and reproductive health.

## PARTICIPANTS AND METHODS

### Sampling procedure

In 2005 and 2010, face-to-face surveys on sexuality-related knowledge, attitudes, and behaviors were carried out on large-scale, national probability-based samples of young adults (24). The response rates were 79.5% in 2005 and 32.1% in 2010, and the non-response rates were 23.4% and 23.8%, respectively. The considerably lower response rate in 2010 corresponds to a long-term negative trend in survey participation (31,32). In 2021, the largest national commercial online panel was employed as the only feasible solution for data collection during the COVID-19 pandemic. Quota-based random sampling of the panel members was used with respect to region, age (18-25 cohort), and gender. After we applied *post-hoc* weighting for gender and age, the sample was broadly representative of the emerging adult population in Croatia. The response rate in the panel was 29%, with 84% of responders completing the survey. The socio-demographic structure of the three samples is presented in Table 1.

### Participants

In 2005, the sample included 1092 participants in the 18-24 age-range ( $M_{age} = 21.0$ , 49.3% female). In 2010 and 2021, the age ranged from 18 to 25 years. In 2010, the sample included 1005 participants ( $M_{age} = 21.5$ , 49.3% female) and in 2021 – 1210 ( $M_{age} = 21.7$ , 48.0% female). The one-year difference in age ranges did not compro-

mise between-study comparisons. All but one out of the 1764 sexually active participants from the 2010 and 2021 samples reported having had the first sexual intercourse under the age of 25. Furthermore, 25-year-olds in 2010 and 2021 did not differ from 24-year-olds in the reported lifetime number of sexual partners ( $\chi^2_{2010}=8.96, P=0.11$ ;  $\chi^2_{2021}=6.94, P=0.23$ ), the number of partners in the past year ( $\chi^2_{2010}=7.17, P=0.10$ ;  $\chi^2_{2021}=0.98, P=0.81$ ), condom use at first intercourse ( $\chi^2_{2010}=0.89, P=0.35$ ;  $\chi^2_{2021}=0.04, P=0.84$ ), and consistent condom use in the past year ( $\chi^2_{2010}=5.01, P=0.08$ ;  $\chi^2_{2021}=1.04, P=0.59$ ). Three participants from the 2021 sample who provided impossible values (eg, being 55 at coital debut) were excluded from the final sample ( $N_{2021}=1207$ ).

### Data collection

In 2005 and 2010, participants were interviewed in their homes. In 2021, computer-assisted web-interviewing was used. Members of the commercial online panel were selected randomly. Data were collected from mid-November 2021 to early January 2022. The study was approved by the Ethics Review Board of the Faculty of Humanities

and Social Sciences, University of Zagreb. All participants gave informed consent verbally or electronically. The 2010 and 2021 surveys additionally included a biological component (not reported here).

### Questionnaire

An originally developed questionnaire on knowledge, attitudes, beliefs, and practices was used. The first part (administered by face-to-face interviewing in 2005 and 2010) asked about socio-demographic characteristics, HIV/AIDS knowledge, attitudes toward gendered sexual roles, beliefs about condom use, and self-esteem. The rest was self-administered and focused on sexual behaviors. The questionnaires consisted of 150-190 items and took 25-30 minutes to complete. The original questionnaire was piloted among high-school and university students. The instruments used for comparisons were identical in all study waves.

### Measures

Age, parental education, family socio-economic status, the type of the longest place of residence, and the frequency

**TABLE 1.** Socio-demographic structure of the study samples by gender

	2005			2010			2021		
	women (n=574) n (%)	men (n=519) n (%)	total (n=1093) N (%)	women (n=495) n (%)	men (n=510) n (%)	total (n=1005) N (%)	women (n=580) n (%)	men (n=627) n (%)	total (n=1207) N (%)
<b>Father's education</b>									
elementary school or less	80 (15.1)	51 (9.4)	131 (12.2)	45 (9.3)	41 (8.1)	86 (8.7)	78 (13.4)	45 (7.1)	122 (10.1)
high school	361 (68.1)	397 (73.1)	758 (70.6)	329 (67.7)	338 (66.7)	607 (67.2)	398 (68.6)	392 (62.5)	790 (65.4)
university degree	89 (16.8)	95 (17.5)	184 (17.2)	112 (23.0)	128 (25.2)	240 (24.2)	105 (18.0)	191 (30.4)	295 (24.5)
<b>Mother's education</b>									
elementary school or less	85 (15.9)	105 (19.0)	190 (17.5)	62 (12.5)	59 (11.6)	121 (12.1)	68 (11.8)	44 (7.1)	112 (9.3)
high school	348 (65.2)	333 (60.2)	681 (62.7)	334 (67.5)	348 (68.4)	682 (67.9)	388 (66.9)	386 (61.5)	774 (64.1)
university degree	101 (18.9)	115 (20.8)	216 (19.8)	99 (20.0)	102 (20.0)	201 (20.0)	123 (21.3)	183 (29.3)	321 (26.6)
<b>Family socioeconomic status</b>									
lower than average	49 (9.1)	42 (7.6)	91 (8.4)	16 (3.2)	21 (4.1)	37 (3.7)	75 (12.8)	58 (9.4)	133 (11.0)
about average	382 (71.3)	391 (71.1)	773 (71.2)	367 (74.1)	365 (71.6)	732 (72.8)	385 (66.3)	385 (61.4)	770 (63.8)
higher than average	105 (19.6)	117 (21.3)	222 (20.4)	112 (22.6)	124 (24.3)	236 (23.5)	121 (20.9)	183 (29.2)	304 (25.2)
<b>Attendance of religious services</b>									
never or non-religious	130 (24.2)	174 (31.6)	304 (28.0)	147 (29.8)	189 (37.1)	336 (33.5)	110 (19.0)	159 (25.4)	270 (22.4)
up to several times a year	182 (33.9)	211 (38.4)	393 (36.2)	185 (37.4)	191 (37.5)	376 (37.5)	306 (52.6)	321 (51.1)	626 (51.8)
once a month	115 (21.4)	75 (13.6)	190 (17.5)	87 (17.6)	66 (12.9)	153 (15.2)	59 (10.2)	56 (8.9)	115 (9.5)
once a week or more	110 (20.5)	90 (16.4)	200 (18.3)	75 (15.2)	64 (12.5)	139 (13.8)	105 (18.2)	91 (14.6)	197 (16.3)
<b>Settlement of longest residence by size</b>									
≤10000 inhabitants	259 (48.9)	305 (55.2)	564 (52.1)	249 (50.4)	256 (50.5)	505 (50.4)	334 (57.5)	291 (46.4)	625 (51.8)
>10000 inhabitants	315 (51.1)	214 (44.8)	529 (47.9)	246 (49.6)	254 (49.5)	500 (49.6)	246 (42.5)	336 (53.6)	582 (48.2)

of attending religious services were assessed as socio-demographic characteristics (Table 1). Risky sexual behaviors were assessed with the following one-item indicators: age at sexual debut (defined as first coital intercourse), protection/contraception use at first sexual intercourse, condom use consistency (past 12 months), the number of sexual partners ("individuals you had vaginal intercourse with") over a lifetime and during the last 12 months, and ever having concurrent sexual relationships. An additional socio-sexual characteristic measured was the gender of sexual partners ("persons with whom you had oral, anal, or vaginal sex").

### Statistical analysis

Survival analysis was carried out to compare coital debut among study waves. The probability of (not) having coitus before a certain age was estimated by Kaplan-Meier curves. The significance of the between-study difference in sexual initiation was assessed with a log-rank test. Cox regression was used to assess changes in sexual initiation when controlling for basic socio-demographic characteristics. To assess change over time in other core indicators of sexual risk-taking (the number of sexual partners in the past 12 months, condom use at first intercourse, consistent condom use, and concurrent sexual relationships), multivariate binary logistic regression analysis was employed with socio-demographics controlled for. All statistical analyses were performed with SPSS Statistics, version 25 (IBM Corp., Armonk, NY, USA). The probability

value  $<0.05$  was set as a threshold for statistical significance.

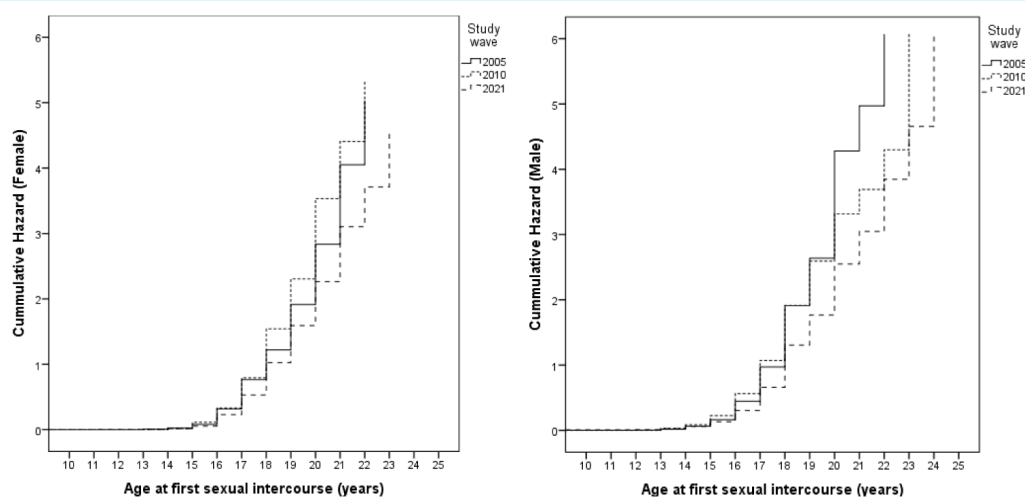
## RESULTS

### Sexual experiences and behaviors over the 2005-2021 period

About 84% female and 88% male participants from the 2005 and 2010 samples experienced sexual intercourse (Table 2). In 2021, the proportion decreased by almost 10% in women and by 20% in men. This change was reflected in the age at sexual debut. Compared with earlier study waves, in 2021 the average age at sexual debut increased by about half a year, to 17.5 years (standard deviation [SD] 2.3) in men (95% confidence interval [CI] 17.3-17.7) and to 17.9 (SD 1.7) in women (95% CI 17.7-18.1). Similarly, the median age at sexual debut increased from 17 years (interquartile range [IQR] 16-18) for both genders in 2005 and 2010 to 18 years in 2021 (IQR 17-19 for women and 16-19 for men).

Kaplan-Meier's estimation of the hazard function of sexual initiation also indicated an increase in age at sexual debut (Figure 1). Log-rank testing confirmed that the change was significant for both women ( $M_{(2)} = 41.68, P < 0.001$ ) and men ( $M_{(2)} = 34.94, P < 0.001$ ).

The lifetime number of sexual partners was three or fewer for most young women across the observed period (Ta-



**FIGURE 1.** Hazard function of sexual initiation in survival analysis indicates an increase in age at sexual debut in both genders in the 2005-2021 period (only participants who reported sexual intercourse were included).

ble 2), with a median of two in 2005 and 2021 and three in 2010 (IQR 1-4 in all cases). The change in the number of sexual partners was more pronounced in young men. While considerable proportions of male participants in the 2005 and 2010 samples reported more than five (around 30%) or even more than 10 (16.5%-22%) lifetime sexual partners, the majority of men in 2021 (around 63%) reported up to three partners. The proportion of those who had a single lifetime partner more than doubled, from about 15% in 2005 and 2010 to 33% in 2021. Accordingly, the median number of men's sexual partners decreased from four (IQR 2-7) in 2005 and five (IQR 3-8) in 2010 to three (IQR 1-5) in 2021. As for the past year, the majority of female participants (69%-79%) reported a single partner. Among men, one sexual partner was reported by the majority of

participants in all study waves as well, with this proportion increasing from about 50% in 2005 and 2010 to 70% in 2021.

In all study waves, roughly twice as many men as women reported ever having concurrent sexual partnerships (Table 2). However, the proportion of participants reporting the experience decreased by a factor of three in both women (from about 17% in 2005 and 2010 to 5% in 2021) and men (from about 30% in 2005 and 2010 to 11% in 2021).

In 2021, condom use at first intercourse was reported by over 80% of female and male participants (Table 2), an increase from the previous wave of about 12% in female and 15% in male participants. Consistent condom use over the

**TABLE 2.** Sexual behaviors, experiences, and patterns of condom use by study year and gender\*

	Women			Men		
	2005 (n=574) % (95% CI) <sup>†</sup>	2010 (n=495) % (95% CI)	2021 (n=580) % (95% CI)	2005 (n=519) % (95% CI)	2010 (n=510) % (95% CI)	2021 (n=627) % (95% CI)
Experience of sexual intercourse	82.7 (79.5-85.9)	84.4 (81.2-87.6)	76.3 (72.8-79.8)	87.7 (85.00-90.4)	87.9 (85.1-90.7)	69.4 (65.8-73.00)
Age of coital debut (years)						
≤15	7.5 (5.0-10.0)	10.7 (7.7-13.7)	5.2 (3.1-7.3)	14.6 (11.4-17.8)	20.2 (16.5-24.0)	12.4 (9.3-15.5)
16	20.0 (16.2-23.8)	17.5 (13.8-21.2)	16.5 (13.0-20.0)	20.9 (13.2-24.6)	22.9 (19.0-26.8)	14.3 (11.0-17.6)
17	27.2 (23.0-31.4)	26.5 (22.2-30.8)	22.5 (18.6-26.4)	26.7 (22.7-30.8)	22.7 (18.8-26.6)	22.9 (19.0-26.8)
18	15.4 (12.0-18.8)	23.8 (19.7-27.9)	24.0 (20.0-28.0)	24.3 (20.4-28.2)	19.5 (15.8-23.2)	24.8 (20.8-28.8)
≥19	30.0 (25.7-34.4)	21.4 (17.4-25.4)	31.7 (27.4-36.0)	13.5 (10.4-16.6)	14.7 (11.4-18.0)	25.6 (21.5-29.7)
Number of sexual partners (lifetime)						
1	35.5 (30.9-40.1)	29.5 (24.1-32.9)	38.0 (33.5-42.5)	14.6 (11.2-18.0)	14.6 (11.2-18.0)	33.0 (25.7-34.3)
2-3	25.8 (22.2-29.4)	29.3 (25.3-33.3)	28.0 (24.4-31.7)	32.6 (28.6-36.6)	22.9 (19.3-26.6)	33.3 (29.6-36.7)
4-5	17.9 (14.2-21.6)	18.7 (14.9-22.5)	13.3 (10.1-16.5)	21.2 (17.3-25.1)	21.0 (17.1-25.0)	17.9 (14.3-21.5)
6-9	8.9 (6.2-11.7)	8.1 (5.5-10.8)	8.8 (6.2-11.4)	15.0 (11.6-18.4)	19.5 (15.7-23.3)	9.2 (6.5-11.9)
≥10	4.5 (2.2-6.5)	6.9 (4.4-9.4)	4.9 (2.9-6.9)	16.5 (13.0-20.0)	22.0 (18.0-26.0)	9.6 (6.8-12.4)
Number of sexual partners (past year)						
0	9.1 (6.4-11.8)	4.2 (2.3-6.1)	7.0 (4.6-9.4)	9.3 (6.6-12.0)	5.3 (3.2-7.4)	9.9 (7.1-12.7)
1	68.8 (64.4-73.2)	72.9 (68.6-77.2)	79.1 (75.3-82.9)	48.1 (43.5-52.7)	49.1 (44.4-53.8)	70.1 (65.8-74.4)
2-3	19.3 (15.5-23.1)	19.1 (15.3-22.9)	12.4 (9.9-15.5)	30.9 (26.7-35.1)	28.6 (24.3-32.9)	15.9 (12.5-19.3)
≥4	2.9 (1.5-4.5)	3.9 (2.0-5.8)	1.5 (0.4-2.6)	11.7 (8.8-14.6)	17.0 (13.5-20.6)	4.0 (2.2-5.8)
Concurrent sexual relationship (ever)	16.5 (13.0-20.0)	17.2 (13.6-20.8)	4.8 (2.8-6.8)	31.1 (26.9-35.3)	29.0 (24.8-33.2)	11.1 (8.2-14.1)
Exclusively opposite-sex sexual partners	92.5 (90.0-95.0)	93.2 (90.8-95.6)	95.5 (93.6-97.4)	93.2 (90.9-95.5)	95.0 (93.0-97.0)	94.0 (91.8-96.2)
Condom use at first sexual intercourse	57.7 (53.1-62.3)	71.4 (67.1-75.7)	83.5 (80.0-87.0)	62.8 (58.9-67.1)	65.8 (61.4-70.2)	81.1 (77.4-84.8)
Consistent condom use (past year; only those who had sex during the past year)	(n=314) 25.9 (21.1-30.8)	(n=319) 29.8 (24.8-34.8)	(n=317) 39.7 (34.3-45.1)	(n=310) 34.0 (28.7-39.3)	(n=322) 32.0 (26.9-37.1)	(n=334) 47.4 (42.1-52.8)

\*Only participants who reported sexual intercourse were included.

†CI – confidence interval.

past 12 months among the sexually active participants increased by 10%-15% in 2021 compared with previous waves. Even with this increase, less than 50% of male and 40% of female participants reported consistent use of condoms in 2021.

### Change in sexual risk-taking in the 2005-2021 period

Next, we assessed temporal changes in the select five indicators of sexual risk-taking (age at coital debut, the number of sexual partners in the past year, condom use at first vaginal intercourse, consistent condom use over the past year, and concurrent sexual relationships) while accounting for basic socio-demographic characteristics. Cox regression indicated that the risk of reporting earlier sexual debut was significantly higher in men in 2005 and 2010 compared with 2021 (by 1.25-1.37 times, respectively), and in women by 1.27 times in 2010 compared with 2021 (Table 3).

Similarly, the odds of reporting any of the four remaining core indicators of sexual risk-taking - when we controlled

**TABLE 3.** Cox regression with age at first sexual intercourse as outcome, study wave as a predictor, and basic socio-demographic characteristics as controls, by gender\*†

	Women AHR (95% CI)	Men AHR (95% CI)
<b>Study wave</b>		
2005	1.12 (0.98-1.28)	1.25 (1.09-1.44) <sup>‡</sup>
2010	1.27 (1.11-1.46) <sup>‡</sup>	1.37 (1.19-1.57) <sup>§</sup>
2021 (referent)	1	1
<b>Age</b>	0.88 (0.85-0.90) <sup>§</sup>	0.89 (0.87-0.92) <sup>§</sup>
<b>Father's education</b>		
elementary school	0.88 (0.70-1.11)	1.12 (0.87-1.45)
high school	0.90 (0.77-1.04)	1.10 (0.95-1.27)
university (referent)	1	1
<b>Mother's education</b>		
elementary school	1.01 (0.81-1.25)	1.16 (0.92-1.46)
high school	1.00 (0.86-1.16)	1.05 (0.91-1.22)
university (referent)	1	1
<b>Family socioeconomic status</b>	1.02 (0.93-1.12)	0.99 (0.90-1.09)
<b>Attendance of religious services</b>	0.91 (0.88-0.94) <sup>§</sup>	0.96 (0.93-0.99) <sup>  </sup>
<b>Settlement of longest residence by size</b>		
≤10000 inhabitants	1.00 (0.90-1.12)	1.12 (0.99-1.26)
>10000 inhabitants (referent)	1	1

\* Abbreviations: AHR – adjusted hazard ratio; CI – confidence interval.

†Only participants who reported sexual intercourse were included.

‡P < 0.01.

§P < 0.001.

||P < 0.05.

for socio-demographic characteristics - were lower in 2021 compared with previous surveys, regardless of gender (Table 4). Female and male participants in 2005 and 2010 were 1.62-3.31 times more likely to report multiple sexual partners in the past year and 3.36-4.64 times more likely to report ever having concurrent sexual partners than in 2021. Compared with 2021, in 2005 and 2010 both genders were less likely to report condom use at first sexual intercourse (by 54%-76%) and consistently over the past 12 months (by 36%-49%).

Overall, the observed associations between study wave and sexual risks were moderate in size in the case of concurrent sexual relationships, condom use at first intercourse, and the number of sexual partners in the past 12 months. In other instances, the effect was small (33).

### DISCUSSION

A previous comparison of the 2005 and 2010 surveys pointed to stable and substantial levels of sexual risk-taking (24). In the 2021 survey, nearly all core sexual risk indicators significantly decreased compared with the 2005-2010 period. However, the prevalence of sexual risk-taking among young people in Croatia remains substantial, particularly the prevalence of inconsistent condom use.

The observed change can be attributed to at least two sets of factors. The first one is related to the COVID-19 pandemic considering that the 2021 wave was conducted 20-22 months after its onset. The imposed restrictions – as well as a spillover effect of sensitization to health-related risks from the COVID-19 infection (34,35) – may have affected sexual behaviors measured in the retrospect of 12 months (fewer sexual partners, more consistent condom use) (34,36-38). A delayed coital debut and a decreased number of sexual partners in younger participants are also possible. Nevertheless, it is unlikely that the change observed in this study is predominantly associated with the pandemic. Most young people did not stop engaging in sexual risk-taking during the pandemic (39-41), some engaging even more intensely so as to counter stress and loneliness (42). Additionally, except in the initial two months of the pandemic, the Croatian government imposed a soft lockdown (43), not limiting within-country movement and social contact in small groups. In a national online survey of emerging Croatian adults' intimacy and sexuality during the COVID-19 pandemic, conducted 10 months following its outbreak (44), only 3% of participants reported pandemic-related separation from their partners. Additionally,

an equal proportion of sexually active participants (12%) reported having no sexual partners or having multiple sexual partners during the pandemic. A lower frequency of condom use during the pandemic was reported by 16% of participants, while only 8% reported an increased frequency of condom use. To summarize, it appears that the pandemic affected the sex lives of a minority of emerging Croatian adults and did so inconsistently, contributing both to less and more sexual risk-taking.

The observed change in sexual risk-taking seems likelier to have been influenced by a second, socio-cultural, set of factors. International studies carried out before the pandemic pointed to a declining trend in sexual activity among younger cohorts in industrialized countries (12-19). Decreased sexual activity, delayed coital debut, and a lower number of sexual partners are attributed to several recent developments. Ubiquitous social media use among young people (45,46) could be a partial replace-

**TABLE 4.** Binary logistic regressions with sexual partners in the past year, condom use at first sexual intercourse, consistent condom use in the past year, and concurrent sexual relationships as outcomes, study wave as predictor, and basic socio-demographics as controls, by gender\*†

	Sexual partners (past year) (0=0 and 1; 1=2 or more)		Condom use at first sexual intercourse (0=no; 1=yes)		Consistent condom use (past year) (0=no; 1=yes)		Concurrent sexual relationships (ever) (0=no; 1=yes)	
	women	men	women	men	women	men	women	men
	AOR (95% CI)†	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
<b>Study wave</b>								
2005	1.62 (1.11-2.34)	2.82 (2.07-3.85)§	0.24 (0.18-0.34)§	0.36 (0.26-0.49)§	0.51 (0.36-0.72)§	0.55 (0.40-0.77)‡	4.64 (2.74-7.85)§	3.92 (2.71-5.67)§
2010	1.70 (1.18-2.45)§	3.31 (2.43-4.51)§	0.46 (0.33-0.65)§	0.44 (0.32-0.60)§	0.64 (0.46-0.90)	0.54 (0.39-0.75)§	4.54 (2.69-7.65)§	3.36 (2.32-4.85)§
2021 (referent)	1	1	1	1	1	1	1	1
<b>Age</b>	0.87 (0.81-.94)§	0.89 (0.84-0.94)§	0.91 (0.88-0.97)‡	0.87 (0.82-0.93)§	0.90 (0.84-0.96)‡	0.87 (0.81-0.93)§	0.97 (0.89-1.06)	1.04 (0.97-1.10)
<b>Father's education</b>								
elementary school	1.00 (0.54-1.84)	0.98 (0.56-1.70)	0.55 (0.33-0.93)	0.75 (0.43-1.30)	0.60 (0.33-1.08)	0.75 (0.37-1.50)	1.79 (0.89-3.61)	0.68 (0.36-1.30)
high school	1.06 (0.72-1.56)	0.77 (0.56-1.04)	0.93 (0.64-1.34)	1.01 (0.73-1.39)	0.82 (0.56-1.20)	1.07 (0.76-1.51)	0.82 (0.51-1.30)	1.02 (0.73-1.44)
university (referent)	1	1	1	1	1	1	1	1
<b>Mother's education</b>								
elementary school	0.93 (0.52-1.68)	1.27 (0.79-2.05)	0.70 (0.42-1.16)	0.87 (0.55-1.43)	0.97 (0.55-1.71)	0.71 (0.40-1.26)	0.43 (0.19-0.98)	1.55 (0.92-2.62)
high school	0.96 (0.65-1.40)	1.17 (0.85-1.61)	0.88 (0.62-1.26)	1.01 (0.73-1.39)	1.00 (0.68-1.48)	0.96 (0.67-1.36)	1.24 (0.78-1.98)	1.06 (0.75-1.51)
university (referent)	1	1	1	1	1	1	1	1
<b>Family socioeconomic status</b>	1.54 (1.21-1.97)‡	1.01 (0.82-1.24)	1.11 (0.90-1.37)	1.33 (1.08-1.65)‡	1.10 (0.87-1.39)	0.83 (0.66-1.05)	1.20 (0.89-1.60)	1.15 (0.91-1.45)
<b>Attendance of religious services</b>	0.84 (0.76-0.93)‡	0.93 (0.86-1.01)	0.99 (0.91-1.08)	1.02 (0.94-1.11)	0.96 (0.87-1.06)	1.02 (0.93-1.12)	0.78 (0.70-0.88)§	0.88 (0.80-0.96)‡
<b>Settlement of longest residence by size</b>								
≤10000 inhabitants	1.41 (1.05-1.90)	0.97 (0.76-1.24)	1.03 (0.79-1.34)	1.10 (0.86-1.41)	0.93 (0.70-1.25)	0.87 (0.66-1.15)	0.97 (0.68-1.38)	1.06 (0.81-1.39)
>10000 inhabitants (referent)	1	1	1	1	1	1	1	1

\*Abbreviations: AOR – adjusted odds ratio; CI – confidence interval.

†Only participants who reported sexual intercourse were included.

‡P < 0.01.

§P < 0.001.

||P < 0.05.

ment or even a barrier for real-life sexual interactions given that online social networking provides new forms of sexual expression (47), increases insecurity regarding physical appearance and sexual performance (48,49), supplies entertainment that may compete with sexual activity (15) (such as video streaming services and online sexual contents) (50), and impedes the development of face-to-face communication skills (51,52). Another possible explanation is delayed transition to adulthood (50,53,54), which involves postponed partnered cohabitation and prolonged co-residence with parents. This entails reduced opportunities for sexual activity and persistent parental control over behaviors that often contribute to sexual risk-taking, such as substance abuse (52). There is also increasing evidence about the effectiveness of comprehensive school-based sex education in promoting condom use, which reduces the risk of acquiring STI, and helps managing potentially harmful effects of sexualized media (13,55-57). Finally, religiosity has been on the rise among young people in the West over the past 15-20 years, a process partially influenced by neo-conservative social and political movements (58). Although religiosity provides limited protection against sexual risk-taking among young people (59,60), intrinsic religiosity is increasing in Croatia (61), with the Catholic church and newly established faith-based civic associations actively encouraging young people to practice and advocate religious values (62,63).

The present study has several limitations. First, the validity of the findings reported across the three surveys is limited by self-reporting and some indicators are additionally affected by recall bias. However, such bias is likely limited, because our participants were in early stages of their sexual lives, and the retrospective measures of sexual behavior were limited to the past 12 months. Additionally, there is no alternative to self-reporting when exploring sexual behaviors such as lifetime number of sexual partners or consistency in condom use. We attempted to minimize social desirability in participants' responses to sensitive questions in the 2005 and 2010 face-to-face surveys by employing experienced interviewers who received an additional six-hour training focused on collecting information on sexuality-related topics. Privacy was secured by measuring sexual behaviors and experiences with a self-administered questionnaire.

Second, health-related and social context surrounding the COVID-19 pandemic may have affected the sexual behavior of young Croatian adults reported in the 2021 survey and reduced comparability with previous surveys. As pre-

viously discussed, if present, this effect is unlikely to have substantially affected the findings considering that the lockdown in Croatia was mild, and emerging adults reported either no effect of the pandemic on their sex lives or reported mixed outcomes (44).

Third, another potential obstacle to between-wave comparisons was the diverging sampling and data collection approach between the 2021 and the 2005 and 2010 studies. The national online panel was used to facilitate data collection during the pandemic, but also to tackle the substantial and continued decrease in response rates observed in conventional field surveys (64), particularly among young people (65). Large self-selection bias calls into question the probabilistic nature of conventional (probability-based) samples, but also data comparison between studies conducted with matching methodologies (66). Additionally, certain drawbacks raised in the context of commercial online samples, such as that participants are "professionalized," were shown not to substantially affect data quality (67). It also needs to be reiterated that in 2005 and 2010 sexual behaviors and experiences - including the core indicators of sexual risk-taking - were measured with a self-administered (paper-and-pencil) questionnaire, a method comparable to self-administered online surveying employed in 2021. Finally, a data harmonization procedure (68) was performed using the 2010 and 2021 surveys to empirically assess the comparability of the data obtained by different sampling and gathering strategies (not reported here). The correlation of correlations test involving single-item measures of sexual behavior, including the core five indicators of sexual risk-taking, suggested adequate within- and between-study construct validity of the measures, justifying the direct data comparisons in the current study (69).

In spite of these shortcomings, the three surveys remain the sole national-level research project in Croatia aimed at monitoring and analyzing sexual behaviors, attitudes, and beliefs among emerging adults.

In conclusion, sexual risk-taking is still relatively frequent among young people in Croatia, but has substantially declined in the past decade. This positive change does not appear to be driven by any systematic efforts to reduce sexual and reproductive health risks. At the national level, public health efforts to improve sexual and reproductive health in young people remain sporadic and lacking in evidence about their efficacy. Due to political controversies, comprehensive sexuality education is not



included in the national educational curriculum despite the fact that the majority of young people (70) and their parents (71) are in favor of such an addition. Continuous monitoring of sexual behaviors in young people therefore remains a public health imperative, as do continued efforts in providing evidence-based prevention, intervention, and systematic education aimed at improving young people's sexual and reproductive health. Findings from this study should be considered when developing sexual health counseling programs delivered by school medicine specialists, who provide preventive health services to school-aged children and university students. Additionally, digital media interventions should be designed to promote sexual health, as such programs reach large audiences at low cost and provide anonymity and privacy for the users (72).

**Funding** The 2005 survey wave was funded by the Global Fund to Fight AIDS, Tuberculosis and Malaria national grant and the Ministry of Health and Social Welfare of the Republic of Croatia; the 2010 survey was funded by the Croatian Ministry of Science, Education, and Sports and the United Nations Development Programme Croatia; the 2021 survey was funded by the Croatian Science Foundation.: (Grant #3609 awarded to the last author).

**Ethical approval** granted by Ethics Review Board of the Faculty of Humanities and Social Sciences, University of Zagreb (2019-14).

**Declaration of authorship** all authors conceived and designed the study; all authors acquired the data; all authors analyzed and interpreted the data; IL drafted the manuscript; all authors critically revised the manuscript for important intellectual content; all authors gave approval of the version to be submitted; all authors agree to be accountable for all aspects of the work.

**Competing interests** All authors have completed the Unified Competing Interest form at [www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf) (available on request from the corresponding author) and declare: no support from any organization for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous 3 years; no other relationships or activities that could appear to have influenced the submitted work.

## References

- Cochran BN, Livingston NA. Sexual risk-taking. In: Goldberg, AE, editor. *The SAGE encyclopedia of LGBTQ studies*. Thousand Oaks: Sage; 2016. p. 1071–75.
- De Graaf H, Verbeek M, Van den Borne M, Meijer S. Offline and online sexual risk behavior among youth in the Netherlands: findings from "Sex under the Age of 25". *Front Public Health*. 2018;6:72. [Medline:29594093](#) [doi:10.3389/fpubh.2018.00072](#)
- Barker DH, Scott-Sheldon LAJ, Gittins Stone D, Brown LK. Using composite scores to summarize adolescent sexual risk behavior: current state of the science and recommendations. *Arch Sex Behav*. 2019;48:2305–20. [Medline:31429032](#) [doi:10.1007/s10508-019-01526-8](#)
- Buttmann N, Nielsen A, Munk C, Liaw KL, Kjaer SK. Sexual risk taking behaviour: prevalence and associated factors. A population-based study of 22 000 Danish men. *BMC Public Health*. 2011;11:764. [Medline:21975163](#) [doi:10.1186/1471-2458-11-764](#)
- Lazarus JV, Moghaddassi M, Godeau E, Ros J, Vignes C, Stergren PO, et al. A multilevel analysis of condom use among adolescents in the European Union. *Public Health*. 2009;123:138–44. [Medline:19152952](#) [doi:10.1016/j.puhe.2008.10.014](#)
- Mercer CH, Tanton C, Prah P, Erens B, Sonneberg P, Clifton S, et al. Changes in sexual attitudes and lifestyles in Britain through the life course and overtime: Findings from the National Surveys of Sexual Attitudes and Lifestyles (Natsal). *Lancet*. 2013;382:1781–94. [Medline:24286784](#) [doi:10.1016/S0140-6736\(13\)62035-8](#)
- Magnusson BM, Masho SW, Lapane KL. Early age at first intercourse and subsequent gaps in contraceptive use. *J Womens Health (Larchmt)*. 2012;21:73–9. [Medline:21992618](#) [doi:10.1089/jwh.2011.2893](#)
- Mokdad AH, Forouzanfar MH, Daoud F, Mokdad AA, Bcheraoui CE, Moradi-Lakeh M, et al. Global burden of diseases, injuries, and risk factors for young people's health during 1990–2013: A systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2016;387:2383–401. [Medline:27174305](#) [doi:10.1016/S0140-6736\(16\)00648-6](#)
- Christie D, Viner R. Adolescent development. *BMJ*. 2005;330:301–4. [Medline:15695279](#) [doi:10.1136/bmj.330.7486.301](#)
- Avery L, Lazdane G. What do we know about sexual and reproductive health of adolescents in Europe? *Eur J Contracept Reprod Health Care*. 2010;13:58–70. [Medline:17886157](#) [doi:10.1080/13625180701617621](#)
- Palmer MJ, Clarke L, Ploubidis GB, Mercer CH, Gibson LJ, Johnson AM, et al. Is "sexual competence" at first heterosexual intercourse associated with subsequent sexual health status? *J Sex Res*. 2017;54:91–104. [Medline:26891245](#) [doi:10.1080/00224499.2015.1134424](#)
- Ramiro L, Windlin B, Reis M, Gabhainn N, Jovic S, Matos MG, et al. Gendered trends in early and very early sex and condom use in 20 European countries from 2002 to 2010. *Eur J Public Health*. 2015;25:52:65–8. [Medline:25805791](#) [doi:10.1093/eurpub/ckv030](#)
- Inanc H, Meckstroth A, Keating B, Adamek K, Zaveri H, O'Neil S, et al. Factors influencing youth sexual activity: conceptual models for sexual risk avoidance and cessation. Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services; 2020.
- Scharamski S, Heßling A. Sexual and contraceptive behavior of adolescents and young adults in Germany. Current results of the representative survey "Youth Sexuality" [in German]. *Bundesgesundheitsbl*. 2021;64:1372–81. [Medline:34596702](#) [doi:10.1007/s00103-021-03426-6](#)
- Ueda P, Mercer CH, Ghaznavi C, Herbenick D. Trends in frequency of sexual activity and number of sexual partners among adults aged 18 to 44 years in the US, 2000–2018. *JAMA Netw Open*. 2020;3:e203833. [Medline:32530470](#) [doi:10.1001/jamanetworkopen.2020.3833](#)
- Herbenick D, Rosenberg M, Golzarri-Arroyo L, Fortenberry JD, Fu

- TC. Changes in penile-vaginal intercourse frequency and sexual repertoire from 2009 to 2018: findings from the national survey of sexual health and behavior. *Arch Sex Behav*. 2022;51:1419-33. [Medline:34799832](#) [doi:10.1007/s10508-021-02125-2](#)
- 17 Slaymaker E, Scott RH, Palmer MJ, Palla L, Marston M, Gonsalves L, et al. Trends in sexual activity and demand for and use of modern contraceptive methods in 74 countries: a retrospective analysis of nationally representative surveys. *Lancet Glob Health*. 2020;8:e567-79. [Medline:32164880](#) [doi:10.1016/S2214-109X\(20\)30060-7](#)
  - 18 Lindberg LD, Firestein L, Beavin C. Trends in U.S. adolescent sexual behavior and contraceptive use, 2006-2019. *Contraception: X*. 2021;3:100064.
  - 19 Liang M, Simelane S, Fortuny Fillo G, Chalasani S, Weny K, Canelos PS, et al. the state of adolescent sexual and reproductive health. *J Adolesc Health*. 2019;65 6S:3-15. [Medline:31761002](#) [doi:10.1016/j.jadohealth.2019.09.015](#)
  - 20 Braxton J, Davis D, Flagg E, Grey J, Grier L, Harvey A, et al. Sexually transmitted disease surveillance 2016. Atlanta: Centers for Disease Control and Prevention; 2017.
  - 21 European Centre for Disease Prevention and Control. Chlamydia infection. Annual epidemiological report for 2016. Stockholm: European Centre for Disease Prevention and Control; 2018.
  - 22 Kreisel KM, Spicknall IH, Gargano JW, Felicia MT, Lewis FMT, Markowitz LE, et al. Sexually transmitted infections among US women and men: prevalence and incidence estimates. 2018. *Sex Transm Dis*. 2021;48:208-14. [Medline:33492089](#) [doi:10.1097/OLQ.0000000000001355](#)
  - 23 Štulhofer A, Graham C, Božičević I, Kufrin K, Ajduković D. HIV/AIDS related knowledge, attitudes and sexual behaviors as predictors of condom use in a nationally representative sample of Croatian young adults 18-24. *Int Fam Plan Perspect*. 2007;33:58-65. [Medline:17588849](#) [doi:10.1363/3305807](#)
  - 24 Landripet I, Štulhofer A, Bačak V. Changes in human immunodeficiency virus and sexually transmitted infections-related sexual risk taking among young Croatian adults: 2005 and 2010 population-based surveys. *Croat Med J*. 2011;52:458-68. [Medline:21853540](#) [doi:10.3325/cmj.2011.52.458](#)
  - 25 Bačak V, Štulhofer A. Condom use errors and problems in a national sample of young Croatian adults. *Arch Sex Behav*. 2012;41:995-1003. [Medline:21882054](#) [doi:10.1007/s10508-011-9838-x](#)
  - 26 Filipović T, Puharić Z, Puharić D, Gašić M. Attitudes and knowledge of students on sexuality in three secondary schools. *Croat Nurs J*. 2020;4:157-64. [doi:10.24141/2/4/2/2](#)
  - 27 Meštrović T, Ljubin-Sternak S, Božičević I, Drenjančević D, Barać A, Kozina G, et al. Human papillomavirus (HPV) prevalence, temporal dynamics and association with abnormal cervical cytology findings in women from Croatia: is there a compounding effect of low-risk/high-risk HPV co-infection? *Clin Lab*. 2020;66:2537-47. [Medline:33337847](#) [doi:10.7754/Clin.Lab.2020.200406](#)
  - 28 Bijelić N. Sex education in Croatia: tensions between secular and religious discourses. *Eur J Womens Stud*. 2008;15:329-43. [doi:10.1177/1350506808095273](#)
  - 29 Štulhofer A. Is there a need for a European-wide initiative on comprehensive sexuality education? Reflections from Croatia. *Sex Educ*. 2016;16:432-8. [doi:10.1080/14681811.2016.1146987](#)
  - 30 Paić A, Labak I. Human Sexuality Education [in Croatian]. *Educ biologiae*. 2020;6:1-11.
  - 31 Bagić D. The influence of refusals on the validity of the pre-election telephone survey: the case of the 2003 parliamentary elections [in Croatian]. *Drus Istraz (Zagreb)*. 2004;71:439-61.
  - 32 Šoša J, Milas G. Slammed door: empirical analysis of survey refusal reasons [in Croatian]. *Drus Istraz (Zagreb)*. 2008;96-97:723-46. Croatian.
  - 33 Henian C, Cohen P, Chen S. How big is a big odds ratio? interpreting the magnitudes of odds ratios in epidemiological studies. *Commun Stat Simul Comput*. 2010;39:860-4. [doi:10.1080/03610911003650383](#)
  - 34 Ko NY, Lu WH, Chen YL, Li DJ, Chang YP, Wu CF, et al. Changes in sex life among people in Taiwan during the COVID-19 pandemic: the roles of risk perception, general anxiety, and demographic characteristics. *Int J Environ Res Public Health*. 2020;17:5822. [Medline:32796759](#) [doi:10.3390/ijerph17165822](#)
  - 35 Bowling J, Montanaro E, Gattuso J, Gioia D, Guerrero Ordonez S. "Everything feels risky now": Perceived risky sexual behavior during COVID-19 pandemic. *J Health Psychol*. 2022;27:1498-506. [Medline:33855871](#) [doi:10.1177/13591053211004684](#)
  - 36 Li G, Tang D, Song B, Wang C, Qunshan S, Xu C, et al. Impact of the COVID-19 pandemic on partner relationships and sexual and reproductive health: cross-sectional, online survey study. *J Med internet Res*. 2020;22:e20961. [Medline:32716895](#) [doi:10.2196/20961](#)
  - 37 Delcea C, Chirilă VI. Săucea, AM Effects of COVID-19 on sexual life – a meta-analysis. *Sexologies*. 2021;30:49-e54. [doi:10.1016/j.sexol.2020.12.001](#)
  - 38 Li W, Li G, Xin C, Wang Y, Yang S. Challenges in the practice of sexual medicine in the time of COVID-19 in China. *J Sex Med*. 2020;17:1225-8. [Medline:32418751](#) [doi:10.1016/j.jsxm.2020.04.380](#)
  - 39 Dacosta L, Pinkus RT, Morandini J, Dar-Nimrod I. Condom use during COVID-19: Findings from an Australian sample of heterosexual young adults. *Sexologies*. 2021;30:e43-8. [doi:10.1016/j.sexol.2020.12.007](#)
  - 40 De Sousa AFL, De Oliveira LB, Queiroz AAFLN, De Carvalho HEF, Schneider G, Camargo ELS, et al. Casual sex among men who have sex with men (MSM) during the period of sheltering in place to prevent the spread of COVID-19. *Int J Environ Res Public Health*. 2021;18:3266. [Medline:33809916](#) [doi:10.3390/ijerph18063266](#)
  - 41 Firkey MK, Sheinfil AZ, Woolf-King SE. Substance use, sexual behavior, and general well-being of U.S. college students during the COVID-19 pandemic: A brief report. *J Am Coll Health*. 2021.

[Medline:33577419](#)

- 42 Lehmiller JJ, Garcia JR, Gesselman AN, Mark KP. less sex, but more sexual diversity: changes in sexual behavior during the COVID-19 coronavirus pandemic. *Leis Sci.* 2021;43:295-304. doi:10.1080/01490400.2020.1774016
- 43 United Nations Human Rights Office. Examples of good practice and challenges faced by Croatian government in ensuring the effective enjoyment of human rights during Covid-19 pandemic. Geneva: The Office of the High Commissioner for Human Rights; 2022.
- 44 Koletić G, Landripet I, Štulhofer A. Intimacy and sexuality among emerging adults in the age of the COVID-19 epidemics: Report on the 2020 and 2022 study waves [in Croatian]. Faculty of Humanities and Social Sciences: Zagreb; 2023.
- 45 Twenge JM, Martin GN, Spitzberg BH. Trends in U.S. adolescents' media use, 1976–2016: The rise of digital media, the decline of TV, and the (near) demise of print. *Psychol Pop Media Cult.* 2018;8:329-45. doi:10.1037/ppm0000203
- 46 Krämer N, Brand M, Döring N, Kruger THC, Van Oosten JMF, Vowe G, editors. Sexual interaction in digital contexts: opportunities and risks for sexual health. Lausanne: Frontiers Media; 2022.
- 47 Döring N, Daneback K, Shaughnessy K, Grov C, Byers ES. Online sexual activity experiences among college students: a four-country comparison. *Arch Sex Behav.* 2017;46:1641-52. Medline:26659580 doi:10.1007/s10508-015-0656-4
- 48 De Graaf H, Ter Schure J, Van Liere GAFS. How old are young people when they start having sex? Unravelling the applicability of Cox proportional hazards regression. *J Public Health.* 2022;30:1873-80. doi:10.1007/s10389-021-01619-6
- 49 Rodgers RF, McLean SA, Paxton SJ. Longitudinal relationships among internalization of the media ideal, peer social comparison, and body dissatisfaction: Implications for the tripartite influence model. *Dev Psychol.* 2015;51:706-13. Medline:25751099 doi:10.1037/dev0000013
- 50 South SJ, Lei L. Why are fewer young adults having casual sex? *Socius.* 2021;7:1-12. doi:10.1177/2378023121996854
- 51 Twenge JM. *iGen: Why today's super-connected kids are growing up less rebellious, more tolerant, less happy—and completely unprepared for adulthood—and what that means for the rest of us.* New York: Atria Books; 2017.
- 52 Ball J, Gruzca R, Livingston M, ter Bogt T, Currie C, de Looze M. The great decline in adolescent risk behaviours: Unitary trend, separate trends, or cascade? *Soc Sci Med.* 2023;317:115616. Medline:36563586 doi:10.1016/j.socscimed.2022.115616
- 53 Twenge JM, Park H. The decline in adult activities among U.S. adolescents, 1976–2016. *Child Dev.* 2019;90:638-54. Medline:28925063 doi:10.1111/cdev.12930
- 54 Sawyer SM, Azzopardi PS, Wickremarathne D, Patton GC. The age of adolescence. *Lancet Child Adolesc Health.* 2018;2:223-8. Medline:30169257 doi:10.1016/S2352-4642(18)30022-1
- 55 Denford S, Abraham C, Campbell R, Busse H. A comprehensive review of reviews of school-based interventions to improve sexual-health. *Health Psychol Rev.* 2017;11:33-52. Medline:27677440 doi:10.1080/17437199.2016.1240625
- 56 Vandenbosch L, Van Oosten JMF. The relationship between online pornography and the sexual objectification of women: the attenuating role of porn literacy education. *J Commun.* 2017;67:1015-36. doi:10.1111/jcom.12341
- 57 Scharmanski S, Hessling A. Sexuality education for young people in Germany. Results of the 'Youth Sexuality' representative repeat survey. *J Health Monit.* 2022;29:21-38. Medline:35891937
- 58 Paternotte D, Kuhar R, editors. *Anti-gender campaigns in europe: mobilizing against equality.* London: Rowman & Littlefield; 2017.
- 59 Koletić G, Landripet I, Tafro A, Jurković L, Milas G, Štulhofer A. Religious faith and sexual risk taking among adolescents and emerging adults: A meta-analytic review. *Soc Sci Med.* 2021;291:114488. Medline:34662764 doi:10.1016/j.socscimed.2021.114488
- 60 Koletić G, Jurković L, Tafro A, Milas G, Landripet I, Štulhofer A. A meta-analytic exploration of associations between religious service attendance and sexual risk taking in adolescence and emerging adulthood. *J Health Psychol.* 2023;18:13591053231164542. Medline:37073440 doi:10.1177/13591053231164542
- 61 Nikodem K, Zrinščak S. Between distanced church religiosity and intensive personal religiosity: religious changes in Croatian society from 1999 to 2018 [in Croatian]. *Drust istraz.* 2019;28(3):371-90.
- 62 Hodžić A, Štulhofer A. Embryo, teddy bear-centaur and the constitution: mobilizations against "gender ideology" and sexual permissiveness in Croatia. In: Paternotte D, Kuhar R, editors. *Anti-gender campaigns in europe: mobilizing against equality.* London: Rowman & Littlefield; 2017. p. 59-77.
- 63 Landripet I, Koletić G, Jurković L, Zrinščak S, Štulhofer A. Construction and evaluation of the faith-based social engagement scale (VIDA) among emerging Croatian adults [in Croatian]. *Rev Sociol.* 2020;50:407-34. doi:10.5613/rzs.50.3.4
- 64 Beullens K, Loosveldt G, Vandenplas C, Stoop I. Response rates in the European social survey: increasing, decreasing, or a matter of fieldwork efforts? *Surv Methods Insights Field.* 2018;6:3.
- 65 Harrison S, Alderdice F, Henderson J, Redshaw M, Quingley MA. Trends in response rates and respondent characteristics in five National Maternity Surveys in England during 1995–2018. *Arch Public Health.* 2020;78:46. Medline:32509303 doi:10.1186/s13690-020-00427-w
- 66 Cheung KL, Ten Klooster PM, Smit C, De Vries H, Pieterse ME. The impact of non-response bias due to sampling in public health studies: A comparison of voluntary versus mandatory recruitment in a Dutch national survey on adolescent health. *BMC Public Health.* 2017;17:276. Medline:28330465 doi:10.1186/s12889-017-4189-8
- 67 Matthijse SM, De Leeuw ED, Hox JJ. Internet panels, professional

- respondents, and data quality. *Methodology*. 2015;11:81-8.  
[doi:10.1027/1614-2241/a000094](https://doi.org/10.1027/1614-2241/a000094)
- 68 Roberts C, Sarrasin O, Stähli ME. Investigating the relative impact of different sources of measurement non-equivalence in comparative surveys. *Surv Res Methods*. 2020;14:399-415.
- 69 Štulhofer A, Landripet I, Koletić G. Changes in the link between religiosity and sexuality in emerging Croatian adults: An analysis of the harmonized national data in the 2010–2021 period [in Croatian]. *Drus Istraz (Zagreb)*.
- 70 Modrić J, Šoh D, Štulhofer A. Attitudes towards comprehensive school-based sex education in croatian schools: results from a national study of youth. [in Croatian]. *Rev Sociol*. 2011;41:77-97.
- 71 Kuštreba I, Elezović I, Štulhofer A. Parents' attitudes about school-based sex education in Croatia. *Sex Res Soc*. 2015;12:323-34.
- 72 Sewak A, Yousef M, Deshpande S, Seydel T, Heshemi N. The effectiveness of digital sexual health interventions for young adults: A systematic literature review (2010-2020). *Health Promot Int*. 2023;38(1):daac104.