Understanding sexual health indicators during adolescence: a study to consider time since sexual debut when exploring multiple sexual partners

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ABSTRACT

Understanding risky sexual behaviors among adolescents is key in efforts devoted to reducing the health burden related to sexually transmitted infections and unintended or unplanned pregnancies. The aims of this study were to understand the association between number of lifetime sexual partners and time since sexual debut (TSSD) among adolescents and to determine whether sex modifies this association. Data were drawn from the 2018–2019 COMPASS-Quebec study, a cohort study conducted in secondary schools in the province of Quebec, Canada. Of 18,467 respondents aged 14 years and older, 6991 (37.9%; mean age 15.3) reported consensual sexual intercourse and answered questions on their age at sexual initiation and number of lifetime sexual partners. Multilevel Poisson regressions with robust standard errors were estimated to adjust for covariates and produce adjusted group mean differences. The adjusted mean number of lifetime sexual partners ranged from 1.5 for those who had recently begun sexual activity (<12 months) to 4.0 for those who had been active for >35 months, an average rise of about 0.6 per year. Females-to-males adjusted mean differences showed that males reported more sexual partners than females at all time points, but the differences were only significant at the shorter (<12 months) and longer (>35 months) time spans. This study highlights the importance of taking into account TSSD when using and interpreting the number of lifetime sexual partners as risky sexual behavior among adolescents. Sex did not have a significant modifying effect on the relationship between number of lifetime sexual partners and TSSD.

Keywords: Adolescence; Sexual debut; Sexual partners; Sex differences.

INTRODUCTION

Sexuality and sexual health are recognized as important dimensions in the development and well-being of young people (World Health Organization, 2010). Initiating sexual activity and experiencing intimate relationships are thus expected during adolescence. However, sexual initiation and experimentation can also be associated with risk-taking, potentially leading to negative health outcomes, such as sexually transmitted infections (STI) and unwanted or unplanned pregnancies. Research to identify risky sexual behaviors is therefore useful to inform prevention and education programs aimed at reducing negative health outcomes (Turchik & Garske, 2009).

Risky sexual behaviors among youth have been defined in various ways. The most commonly used variables are unprotected sex, early sexual initiation, and multiple sexual partners (Camirand, Traoré, & Baulne, 2016; Public Health Agency of Canada, 2019; Ritchwood, Ford, DeCoster, Sutton, & Lochman, 2015; Sales, Brown, Vissman, & DiClemente, 2012). The multiple sexual partners variable has been widely explored in relation to STIs, as it increases the probability of being exposed to pathogens through multiple contacts (Ashenhurst, Wilhite, Harden, & Fromme, 2017; Dickson, Paul, Herbison, McNoe, & Silva, 1996; Dimbuene, Emina, & Sankoh, 2014; Valois, Oeltmann, Waller, & Hussey, 1999).

The literature is inconsistent regarding both the number of sexual partners to be defined as a risk during adolescence (Baumann, Bélanger, Akre, & Suris, 2011; Eaton et al., 2008; Kann et al., 2018; Lehavot et al., 2014; Lehrer, Shrier, Gortmaker, & Buka, 2006; Olesen et al., 2012; Santelli, Brener, Lowry, Bhatt, & Zabin, 1998; Traoré et al., 2018; United Nations Programme on HIV/AIDS (UNAIDS), 2013) and the time period used to assess this number. Some studies used a lifetime period (Baumann et al., 2011; Bruederle, Delany-Moretlwe, Mmari, &

Brahmbhatt, 2019; Eaton et al., 2008; Grossbard, Lee, Neighbors, Hendershot, & Larimer, 2007; Kann et al., 2018; Santelli et al., 1998), while others focused on a limited time period (Ashenhurst et al., 2017; Olesen et al., 2012; Scott et al., 2011; United Nations Programme on HIV/AIDS (UNAIDS), 2013; Ybarra, Rosario, Saewyc, & Goodenow, 2016). For example, some studies found that a higher number of lifetime sexual partners was more prevalent in upper grades (Eaton et al., 2008; Kann et al., 2018; Valois et al., 1999), and others, that early sexual debut was found to be associated with multiple sexual partners (Albert, Brown, & Flanigan, 2003; Kastbom, Sydsjö, Bladh, Priebe, & Svedin, 2015; Ma et al., 2009; Sandfort, Orr, Hirsch, & Santelli, 2008; Tuoyire, Anku, Alidu, & Amo-Adjei, 2018). A logical explanation for such associations would seem to be the time since sexual debut (TSSD): the earlier sexual activity begins, the greater the likelihood of having multiple sexual partners due to longer exposure. This issue has been highlighted for substance use, with early initiators having higher rates of substance use because of their longer exposure to risk (Patton et al., 2004). However, even though some studies have pointed out this limitation (Baumann et al., 2011; Kastbom et al., 2015; Lehrer et al., 2006), the use of TSSD in sexual health studies among youth remains sparse. Moreover, the natural history of multiple sexual partnering among adolescents remains to be described.

The aims of this study were, first, to understand the association between number of lifetime sexual partners and TSSD among a sample of sexually active adolescents and, second, to determine whether sex modifies this association. Some studies have identified a sex difference, with males reporting more sexual partners than females (Bruederle et al., 2019; Lehrer et al., 2006; Romero-Estudillo, González-Jiménez, Mesa-Franco, & García-García, 2014; Traoré et al.,

2018), while others have found no significant differences in adolescence (Vasilenko & Lanza, 2014).

METHOD

Survey design and study population

The COMPASS Study (Leatherdale et al., 2014) is a prospective cohort study (2012–2021) designed to collect hierarchical and longitudinal data annually from a convenience sample of secondary school students and the schools they attend. In accordance with an active-information passive-consent parental permission protocol, students are eligible if their parent(s) or guardian(s) do not withdraw their child from the survey. Eligible students who agree to participate answer a pen-and-pencil self-administered anonymous questionnaire that covers a broad spectrum of topics, such as substance use, bullying, violence, mental health, and other health-related behaviors. A full description of the COMPASS host study is available online (www.compass.uwaterloo.ca) and in print (Leatherdale et al., 2014).

In 2016, a sample of schools in Quebec City (COMPASS-Quebec) was voluntarily recruited to join the COMPASS host study. The recruitment and data collection protocols remained the same as the COMPASS host study; however, the recruitment and data collection tools were translated into French and additional questions related to student sexual health were added to the COMPASS-Quebec student questionnaire.

For this paper, data were drawn from the COMPASS-Quebec project. The study population includes all students in the five years of the secondary level.[1] Students aged 14 years

[1] In the province of Quebec, secondary schools cover five years, grades 1 to 5, equivalent to grades 7 to 11 in the U.S. and the rest of Canada.

and older are invited to respond to a subset of questions related to their behaviors and perceptions in relation to sexuality.

The data used in the present study were drawn from the Year 3 data collection, conducted during the 2018–2019 school year. Overall, parents' refusal rate was 0.1% (32 cases), and about 8% of students were not reached, either because of personal refusal or absence on the day of the survey. Of 18,467 respondents aged 14 years and older, 6991 (37.9%; mean age 15.3; 51.3% females) answered yes to the filter question, *Have you ever had sexual intercourse (oral, vaginal, or anal) with your consent?* of the sub-questionnaire on sexuality, and were invited to answer additional questions.

Variables

The number of lifetime sexual partners was obtained from the response to the question, *With how many different people have you had sexual intercourse (oral, vaginal, or anal) with your consent?* Response options ranged from one person to nine or more. This variable was used as a continuous one ranging from 1 to 9.

TSSD was obtained by subtracting age at first consensual sexual intercourse from age at time of survey and then recoded into four subcategories: less than 12 months, 12–23 months, 24–35 months, and 36 months or more. Age at first consensual sexual intercourse was measured by asking, *How old were you when you first had sex (with your consent)?* Seven response options were offered, ranging from 12 years or younger to 18 years or older.

Sex was used as a potential modifier of the relationship between number of lifetime sexual partners and TSSD. Covariates used for adjustments in statistical analyses were: age at first consensual sexual intercourse, ethnicity (non-white, white), family deprivation, and depression symptoms. These were chosen on the basis of their known association with risky

sexual behaviors, and especially with multiple sexual partners (Cavazos-Rehg et al., 2011; Valois et al., 1999; Vasilenko & Lanza, 2014). Early sexual initiation was also defined according to the answer to the question on the age at first consensual sexual intercourse. The seven response options were dichotomized by defining early sexual initiation as occurring before the age of 14 (Kastbom et al., 2015; Young, Burke, & Nic Gabhainn, 2018). Age at first consensual sex allows us to create TSSD and early sexual initiation. In a developmental and behavioral approach, we hypothesized that a TSSD of 2 years before the age of 14 and a TSSD of 2 years at the age of 16, for example, will not have the same influence on the number of sexual partners.

Family deprivation was based on a proxy variable whose value was 1 (0 otherwise) in the presence of at least one of three situations: 1) having less than $6 a week for personal spending or savings; 2) sometimes skipping breakfast because there is nothing to eat at home; or 3) sometimes going to bed hungry at night because there is not enough money to buy food.

Depression symptoms were drawn from the *Center for Epidemiologic Studies Depression Scale Revised* (Eaton, Smith, Ybarra, Muntaner, & Tien, 2004). This scale includes 10 items referring to the past seven days (e.g. *I had trouble keeping my mind on what I was doing*). Total score could range from 0 to 30, with a score of 10 or higher being considered a threshold signaling the presence of significant depressive symptoms.

Data Analysis

Multilevel Poisson regressions with robust standard errors were estimated to adjust for covariates and produce adjusted group mean differences. Possible modifying effects were explored through double group mean differences (margins command in Stata®). There was no attempt to impute missing values of the dependent variables (rate of missing values = 2.7%) or

the covariates (overall rate of missing values = 6.5%). All analyses were performed with Stata® 16.0 (StataCorp, College Station, Texas).

RESULTS

More than one-third (38%) of respondents reported being sexually active. Table 1 presents the characteristics of those students. The prevalence of early sexual initiation (before age 14) was about 20%. Two out of three respondents reported TSSD of less than 24 months. Mean number of lifetime sexual partners was 2.4 (males 2.5, females 2.2).

[Insert Table 1 here]

The adjusted mean number of lifetime sexual partners ranged from 1.5 for those who had recently begun sexual activity (<12 months) to 4.0 for those who had been active for 36 months or more, an average rise of about 0.6 sexual partners a year.

[Insert Table 2 here]

The females-to-males adjusted mean differences showed significant differences in numbers of partners in the first stratum (less than 12 months since sexual debut), with a difference of 0.2 partners between females and males, and a greater differential number of partners appearing in the 4th stratum (36 months or more since sexual debut), with a difference of 0.5 partners. Between these two durations, the difference between females and males disappeared. Significant differences remained slight (-0.21 for <12 months, -0.54 for >35 months since sexual debut).

[Insert Figure 1 here]

The number of partners predicted after adjustment increased gradually with duration of sexual activity, reaching a mean of 3.74 [CI 3.53, 3.95] for females and 4.27 [CI 3.95, 4.59] for

males among respondents who had been active for at least 36 months. Difference-in-difference analysis, however, did not rule out the hypothesis of equal progression in both sexs (Table 3).

[Insert Table 3 here]

DISCUSSION

This study highlights the importance of considering TSSD when using and interpreting the number of lifetime sexual partners among adolescents. Previous studies (Albert et al., 2003; Eaton et al., 2008; Kann et al., 2018; Kastbom et al., 2015; Ma et al., 2009; Sandfort et al., 2008; Tuoyire et al., 2018; Valois et al., 1999) have found associations between multiple sexual partners and upper grades, older age, and/or early sexual initiation. However, TSSD has rarely been considered, whereas the number of lifetime sexual partners would appear to depend more on this variable than on those three (Baumann et al., 2011).

The present study sheds light on the association between number of lifetime sexual partners and TSSD in the first years of sexual activity among adolescents. Regardless of age at sexual initiation, over the subsequent four-year period the mean number of lifetime sexual partners was found to be 2.5, representing an average increase of 0.6 per year. These results show an average progression in the number of sexual partners that is relatively linear and regular in the first years of sexual activity. When number of sexual partners is used as a risk factor without considering TSSD, some might conclude that adolescents have a lot of casual sexual partners or one-night stands. Therefore, such linear results when TSSD is taken into account could challenge public opinion and societal perception about adolescent sexuality. Indeed, As such, one way to look at risky behaviors would be to define them in terms of where they fit in relation to norms, rather than applying a predefined number or threshold. In this vein, previous studies (Huang, Murphy, & Hser, 2012; Lansford et al., 2010; Moilanen, Crockett, Raffaelli, &

Jones, 2010; Rossi, Poulin, & Boislard, 2017) have aimed to define normative and deviant pathways in relation to sexual behaviors. For example, Rossi et al. (Rossi et al., 2017) identified four trajectory groups among young people aged 16 to 22 years regarding number of sexual partners: abstainers, low-increasing, medium-increasing, and multiple-partners. However, none of these studies considered TSSD in their analyses, with the period assessed for sexual partners being limited to the past year. The challenge that therefore persists is to define thresholds and healthy trajectories. In the current paradigm, an adolescent who does not conform to the trend and reports a significantly higher number of sexual partners could be regarded as representing a potential risk in terms of multiple partners. However, having multiple sexual partners is not necessarily an indicator of unhealthy sexual behavior unless it is done without protection. So, in addition to TSSD, other variables must be considered when trying to understand risky sexual behavior, particularly protection and contraception use, among adolescents.

As with other studies (Albert et al., 2003; Kastbom et al., 2015; Ma et al., 2009; Sandfort et al., 2008; Tuoyire et al., 2018), the present study found that earlier debut of sexual activity was associated with a higher number of lifetime sexual partners. Sexual initiation at an early age is also considered a risk because of other factors, such as adolescents' ongoing cognitive development, sensitivity to peer pressure, and greater impulsivity (Rossi et al., 2017; Steinberg et al., 2008; Sumter, Bokhorst, Steinberg, & Westenberg, 2009). However, it seems more appropriate to consider and interpret the association between early sexual initiation and number of sexual partners in terms of duration of risk exposure rather than a particular age or pre-set threshold.

In the initial years of sexual activity, females and males tend to follow a similar trajectory regarding number of sexual partners when TSSD is taken into account. In the present study, sex

did not have a significant modifying effect on the relationship between the numbers of lifetime sexual partners and TSSD. Furthermore, females and males followed similar trajectories even when they initiated sexual activity at different ages, such that the number of sexual partners in the first four years was not sex-related. This result is inconsistent with several studies (Bruederle et al., 2019; Lehrer et al., 2006; Romero-Estudillo et al., 2014; Traoré et al., 2018) that found males reporting higher numbers of sexual partners. Other studies have, however, challenged this difference as being potentially attributable to a bias in males' responses (Mitchell et al., 2019).

This study presents certain limitations that should be kept in mind. First, as with all population-based surveys of youth, sexual practices are documented based on respondents' self-reports, which may lead to underestimation of certain risky behaviors. This risk is mitigated, however, by the anonymity of the questionnaires (Brener, Billy, & Grady, 2003). Moreover, the high response rate indicated that adolescents were not embarrassed by the topic of sexual activity, which was addressed only at the end of the COMPASS-Quebec questionnaire, by which time some respondent fatigue might have been expected. Second, the results are not fully generalizable to other contexts, including the province of Quebec or its regions, as it is a convenience sample and school participation in the COMPASS-Quebec study is voluntary. The solicitation was carried out on convenience basis by the school boards; there is no reason to believe there is a serious selection bias at this level, since 90% of the schools solicited gave their consent. Moreover, student participation is probably free of the risk of selection bias, as: 1) less than half a percent of the parents asked to withdraw their children from the study; 2) the response rate in the participating schools varied between 80% and 90%, proportions that correspond to the rates of presenteeism observed. The results should nevertheless be interpreted with caution and not generalized. Third, no information was collected on relationships, simultaneous sexual

activity, or protection/contraception (only on condom use at last intercourse) (Dimbuene et al., 2014; Grossbard et al., 2007). Lastly, we used covariates that were available in the COMPASS study, but other confounders may be included.

Further studies are needed to determine whether questions on recent sexual partners with a time-limited assessment are more appropriate for studying risky sexual behaviors among adolescents. However, given a recent study (Haderxhanaj, Leichliter, Aral, & Chesson, 2014) found that number of lifetime sexual partners was associated with the number of recent sexual partners, showing that lifetime assessment is also important to understand recent risky sexual behaviors. How time since sexual debut may impact other risky sexual behaviors, such as non-use of condoms, remains a question of interest. Finally, as mentioned, having multiple sexual partners is not necessarily unhealthy unless it is done without protection. Therefore, future research should consider protection and contraception use in their interpretation of risky sexual behaviors among adolescents.

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or provincial research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. All procedures in the COMPASS study received ethics approval from the University of Waterloo Research Ethics Board (ORE 30118), as well from the Research Ethics Review Board of the

Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale [#MP-13-2017-1264] and participating school board review panels.

Informed Consent

The protocol for COMPASS involves active-information passive-consent parental permission procedures. Students could decline to participate at any time.

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Table 1. Characteristics of sexually active respondents and number of lifetime sexual partners, crude prevalence and mean

	Sexually active		Number of lifetime sexual partners	
	N	**%***	**N**	**Mean±SD**
All respondents	6991	100.0	6800	2.4±.03
Sex				
Male	3388	48.7	3286	2.5±.04
Female	3573	51.3	3485	2.2±.03
Age at time of survey (years)				
14	1084	15.5	1047	2.2±.07
15	1819	26.0	1178	2.1±.04
16	2455	35.1	2380	2.3±.04
17 or older	1633	23.4	1595	2.9±.06
Grades (secondary level)				
1–2	719	10.7	691	2.5±.09
3	1493	22.2	1456	2.2±.05
4	1964	29.2	1910	2.2±.04
5	2550	37.9	2487	2.5±.04
Ethnicity				
White	5948	85.2	5798	2.2±.02
Non-White	1035	14.8	994	3.3±.09
Family deprivation				
Yes	960	13.7	932	2.9±.09
No	6028	86.3	5867	2.3±.03
Depression				
Yes	2833	41.5	2757	2.5±.04
No	3992	58.5	3889	2.3±.03
Early sexual initiation				
<14 years old	1392	20.2	1357	3.8±.08
14 years old or older	5486	79.8	5365	2.0±.02
Months since sexual initiation				
0–11	1937	28.2	1884	1.4±.03
12–23	2564	37.3	2508	2.0±.03
24–35	1437	20.9	1407	3.0±.06
≥36	940	13.7	923	4.6±.09

* Percentages are proportions among all respondents aged 14 years or older who reported being sexually active.

Table 2. Adjusted mean number of lifetime sexual partners among sexually active participants

	Adjusted mean±SD	Mean difference [95 CI]	Risk ratio [95 CI]
Sex			
Male	2.46±.05	(ref)	(ref)
Female	2.25±.03	-0.22 [-0.31, -0.12]	0.87 [0.81, 0.93]
Sexual initiation			
<14 years old	2.68±.07	0.45 [0.31, 0.60]	1.20 [1.14, 1.27]
≥14 years old	2.23±.03	(ref)	(ref)
Time since sexual debut (months)			
0–11	1.48±.03	(ref)	(ref)
12–23	2.00±.04	0.53 [0.43, 0.63]	1.30 [1.19, 1.43]
24–35	2.91±.07	1.43 [1.29, 1.57]	1.89 [1.74, 2.05]
≥36	4.00±.11	2.52 [2.29, 2.75]	2.69 [2.44, 2.96]
Ethnicity			
White	2.27±.04	(ref)	(ref)
Non-White	2.79±.08	0.52 [0.33, 0.71]	1.22 [1.14, 1.32]
Depression			
Yes	2.45±.04	0.17 [0.09, 0.25]	1.07 [1.04, 1.11]
No	2.28±.04	(ref)	(ref)
Family deprivation			
Yes	2.57±.07	0.25 [0.12, 0.38]	1.11 [1.05, 1.17]
No	2.32±.03	(ref)	(ref)

Table 3. Adjusted mean number of lifetime sexual partners and effect of sex on number of lifetime sexual partners by time since sexual debut

	Females			**Males**			Difference in mean differences
Modality	Mean CI	Mean Difference		Mean CI	Mean Difference		
		Contrast	Mean Diff CI		Contrast	Mean Diff CI	
(1) T1: 0–11 months	1.37 [1.31, 1.43]	Ref.		1.59 [1.49, 1.69]	Ref.		
(2) T2: 12–23 months	1.95 [1.87, 2.02]	(2)-(1)	0.57 [0.49, 0.66]	2.07 [1.94, 2.19]	(2)-(1)	0.48 [0.32, 0.65]	0.09 [-0.07, 0.25]
(3) T3: 24–35 months	2.82 [2.67, 2.98]	(3)-(1)	1.45 [1.29, 1.60]	3.00 [2.80, 3.20]	(3)-(1)	1.41 [1.21, 1.62]	0.03 [-0.20, 0.27]
(4) T4: 36 months or more	3.74 [3.53, 3.95]	(4)-(1)	2.37 [2.15, 2.59]	4.27 [3.95, 4.59]	(4)-(1)	2.68 [2.35, 3.02]	-0.31 [-0.63, 0.00]

Figure 1. Adjusted mean number of lifetime sexual partners according to time since sexual debut, overall and by sex