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Trajectories of Annual Number of Sexual Partners from Adolescence to Emerging Adulthood: Individual and Family Predictors

Erika Rossi¹ · François Poulin¹ · Marie-Aude Boislard¹

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Abstract Adolescent sexual development is not the same across the board, and can be seen as both normative as well as risky behavior, depending on factors such as age of onset and number of partners. This longitudinal study identified developmental trajectories of annual number of sexual partners from adolescence to emerging adulthood and their antecedents. From the ages of 16–22, 332 participants (60.8 % females) annually reported their number of sexual partners. Measures of adolescent and family characteristics taken at ages 13–15 were used as predictors. Group-based modeling identified four trajectory groups: the abstainers group (9.1 %), low-increasing group (30.6 %), medium-increasing group (53.0 %), and multiple-partners group (7.3 %). Multinomial logistical regressions indicated that better social competence increased chances of belonging to the multiple-partners group as compared to the abstainers and low-increasing groups, and more substance use predicted membership in the multiple-partners group as compared to the abstainers group. Moreover, females were over-represented in the low-increasing and medium-increasing groups. These results imply a greater diversity in sexual development than proposed in the literature and highlight the importance of identifying the strengths and competencies associated with healthy sexual development along with the early risk factors.

Keywords Sexual development · Adolescence · Longitudinal study · Emerging adulthood

✉ François Poulin
poulin.francois@uqam.ca

¹ Université du Québec à Montréal, 100 Sherbrooke West, Québec, Canada H2X 3P2

Introduction

While engagement in sexual behaviors is now considered normative in adolescence (Tolman and McClelland 2011), research indicates that early starters are more vulnerable to potential risks and subsequent health outcomes, such as non-consensual sexual interactions (De Graaf et al. 2012), more condomless sex (Siebenbruner et al. 2007), and other undesirable long-term sexual health outcomes (Sandfort et al. 2008). Adolescents who engage in early sex tend to cumulate more sexual partners over time (Rotermann 2008), have higher probabilities to contract sexually transmitted infections (Kaestle et al. 2005), and become pregnant as a teenager (Wellings et al. 2001). Moreover, younger adolescents are generally more impulsive (Steinberg et al. 2008) and more sensitive to social pressure (Sumter et al. 2009). Furthermore, sexual precocity is often comorbid with other psychosocial problems, mostly externalizing symptoms (Boislard and Poulin 2011) and internalizing symptoms. As such, in adolescent sexuality research, one of the most commonly studied variables has been age at first sexual intercourse (Boislard et al. 2016).

However, using the number of partners as a basis for sexual developmental trajectories could provide better insight into how sexual behavior develops over time, in both risky and normative pathways, and enlarge the static view of development based on an examination of the timing of sexual onset in terms of early, on-time or late onset. In such trajectory studies, individuals' shared pathways of sexual development represent behavior spanning several years rather than at a single point in time and are therefore particularly informative. The current study aimed to identify trajectories of the number of sexual partners from adolescence to emerging adulthood and to examine whether

individual and family factors predicted membership in these distinct pathways.

In their review of 35 longitudinal studies on the timing of sexual onset among adolescents, Zimmer-Gembeck and Helfand (2008) proposed a multiple-pathway model of sexual development. This model posits that adolescent sexual behavior can be viewed as part of healthy development as well as within a deviant or risky context, although the latter has been the focus of more research than the former (Boislard et al. 2009; Tolman and McClelland 2011). Hence, adolescents belonging to normative pathways have been underrepresented in the research on adolescent sexuality (Boislard and Zimmer-Gembeck 2011).

To identify distinct shared pathways, it is necessary to examine both the onset *and* the heterogeneity of changes in a given variable over time. One way of doing this is through multilevel non-parametric analysis, which assumes that a population consists of multiple subgroups that differ from one another. The members of these subgroups are purported to develop similarly with regard to a particular aspect, in this case, sexual development. The number of sexual partners can be examined in order to study sexual development over time. One such study identified four distinct trajectories of sexual risk from ages 16–22 and found that participants characterized by greater delinquency and substance use were more likely to belong to the high-risk group (Moilanen et al. 2010). Similarly, another study identified five trajectories of sexual risk behaviors from ages 15–23 and found delinquent behavior at age 14 to be highly associated with membership in the higher-risk group (Huang et al. 2012). Both of these studies used composite scores of sexual risk that included number of sexual partners among other indicators. Another study involved 527 participants who reported their number of sexual partners annually from ages 16–22, as the basis for identifying trajectories in sexual behavior (Lansford et al. 2010). Using an unconditional growth model, this study brought out three trajectories: the “zero-initial” trajectory, characterized by no sexual partners at age 16 (65.8 %); the “one-initial” trajectory, characterized by one sexual partner at age 16 (14.8 %), and the “multiple-initial” trajectory, characterized by a mean of 2.4 sexual partners at age 16 (19.4 %). Both the “zero-initial” and “one-initial group” showed a significant increase in the number of partners during late adolescence. During early adulthood, however, the group characterized by no partners at age 16 showed a significant decline in the rate of increase while the group with one partner at age 16 showed a significant decline in the number of partners. The “multiple-initial” group was the only group that showed a significant decline during late adolescence, followed by a significant increase after the age of 20.

Lansford et al.’s (2010) results support heterogeneity in adolescent sexual development. However, certain questions

remain. First, it appears possible that a subgroup of abstainers was underrepresented. While estimates of adult virginity have been inconsistent, longitudinal studies with the *Add Health* sample reveal that 8 % of 11,407 18–27 year olds (mean age 21.85) were virgins at wave III (Halpern et al. 2006), and that of those who were virgins at age 18, more than one in eight remained sexually abstinent at age 28 (Haydon et al. 2014). Whether they abstain by choice, lack of opportunity, or lack of sexual interest, sexual abstainers share a distinct pathway of sexual development. Second, all previously mentioned studies have used American samples. In 2010, the American Centers for Disease Control and Prevention revealed that 13.8 % of students in grades 9–12 had already had four or more sexual partners (CDC 2009). In comparison, in the province of Quebec (Canada) where the current study was conducted, 30 % of sexually active high school students aged 14–17 reported having had three or more partners (Pica et al. 2012), and 37 % reported some experience with oral, vaginal or anal sex. These numbers suggest that sexual trajectories found in American samples may not necessarily generalize to Canadian youth and thus warrant further examination. Third, given that the multiple-pathway model of sexual development (Zimmer-Gembeck and Helfand 2008) posits the existence of both risky and healthy sexual trajectories, predictors of these pathways should include competencies in addition to their focus on risky behaviors.

Identifying Predictors of Trajectories

According to the biopsychosocial perspective (Weiss 2000), individual factors (i.e., biological, psychological) and environmental factors (i.e., family structure) are likely to predict membership in trajectories of sexual development. Moreover, a multiple-pathway model of sexual development also suggests that some pathways might be predicted by individual vulnerabilities whereas others might be explained by the presence of positive traits. While Lansford et al.’s (2010) “multiple-initial” group may be posited to represent Zimmer-Gembeck and Helfand’s (2008) deviant pathway, it is unclear whether either of the other two groups is associated with certain skills or certain domains of competencies. In addition, Arnett’s theory (2000) on the commonalities in the developmental trajectories of emerging adults provides a conceptual lense to examine these trajectories. This theory suggests that emerging adults are characterized by identity formation, exploration, instability, optimism toward future and focus on their sense of self. These hypothesized distinctive features of the developmental period bridging adolescence to adulthood are helpful when examining changes through time and differences in the individual trajectories, especially with regard to the

levels of instability and the domains most invested for exploring and consolidating one's identity. Surprisingly, very few studies have addressed youth sexual development from this perspective. This study is an attempt to do so.

Individual Predictors

Gender appears to play a role in number of sexual partners. A recent Quebec report found that more boys reported having had three or more oral, vaginal, or anal sexual partners than girls (Pica et al. 2012). Moreover, a meta-analysis found that men report more sexual behaviors and have more permissive attitudes toward casual sex than women (Peterson and Hyde 2010). On the other hand, girls report more feelings of guilt and less pleasure from their first sexual experience than boys, although the magnitude of these differences diminishes over time (Sprecher 2014). Because girls' first experiences are generally less positive than boys', girls may be less likely to seek out subsequent experiences, and would therefore report fewer partners. Taken together, these findings suggest that boys may report more partners than girls during adolescence. Puberty may also play a role in number of sexual partners. An association between pubertal development and early sexuality, especially in girls, has been found in many studies (Mendle et al. 2007; Zimmer-Gembeck and Helfand 2008). Given that earlier age of first sexual intercourse has been found to increase subsequent risky sexual behaviors and potential health outcomes, it appears likely that earlier developing teens would report a greater number of sexual partners (Kaestle et al. 2005).

Greater alcohol and substance use have consistently been associated with having an earlier sexual debut as well as with a greater number of partners (Zimmer-Gembeck and Helfand 2008). Additionally, alcohol has been associated with having multiple partners (Cooper 2002). Antisocial behavior has also been linked with earlier sexual debut, although gender differences have been identified (Boislard et al. 2013). Delinquency, antisocial behavior, and having delinquent peers have been found to predict earlier sexual debut, which in turn has been associated with other risky behaviors (French and Dishion 2003). Sensation-seeking may explain the association between substance use, antisocial behavior and risky sexual behavior. Adolescents who have a desire for strong sensory stimulation report more reckless behavior, such as vandalism, theft, unprotected sex, and a higher number of sexual partners (Arnett 1996).

Finally, studies have reported more depressive symptoms in early-starting girls, although the results are inconsistent (Martin et al. 2005; Meier and Allen 2009; Zimmer-Gembeck and Helfand 2008). Perhaps it is less the timing of sexual debut than the number of sexual partners that is linked with internalizing problems. Within youth's romantic

relationships, persistent depressive symptoms often lead to the avoidance of the depressed partner (Coyne 1976a, b). This rejection could lead to a lack of experience in maintaining stable romantic relationships, and increase the number of changes in sexual partners. Moreover, adolescents with greater internalizing symptoms may be at risk for interpersonal instability (Chan and Poulin 2009), which could lead to a greater number of sexual partners.

Apart from the pace of physical maturation and problem behaviors, other individual characteristics are also expected to influence sexual development among youth. For instance, social and academic competencies may have compelling effects on sexual involvement at a time when both peer relationships and professional identity are forming and evolving. Indeed, research has shown that socially competent individuals have more success finding sexual partners. For example, a strong longitudinal association has been found between sociability at 30 months and number of sexual partners at age 19 (Zimmer-Gembeck et al. 2004). Another study showed that sexually active adolescents were rated as more popular by their peers (Prinstein et al. 2003). Altogether, these studies suggest that their peers often perceive socially competent youth as desirable romantic and sexual partners. It can be hypothesized that these socially competent youth are involved in dating in middle and late adolescence, a time when romantic relationships are increasingly invested. However, it remains unclear whether they get involved in stable romantic relationships with a chosen partner with whom they have intercourse, and whether they engage in coitus activities with all dating partners. Even though social competency tends to increase popularity among peers, being popular alone may not be the only factor influencing sexual involvement, especially at a time where professional goals are forming and academic success has impact on future career opportunities. Thus, it seems important to examine academic and social competency in parallel. There is longitudinal evidence that high educational goals and achievement delay sexual intercourse (Schvaneveldt et al. 2001), and that competence in the academic domain can have a protective effect against risky sexual behaviors (Capaldi et al. 1996; Santelli et al. 2004), possibly through less partner changes, or by choosing partners also involved in their academic and professional development, through selection effects.

Family Predictors

With regard to family factors, empirical studies and literature reviews have tended to show that adolescents who grow up in intact families are more likely to postpone sexual activity and to report fewer sexual experiences than their peers from non-intact families (Sturgeon 2002). Moreover, families characterized by high parental

monitoring (the extent to which parents supervise and are aware of their child's activities) are more likely to postpone sexual activity and to have fewer sexual partners (Boislard and Poulin 2011; Parkes et al. 2011; Sturgeon 2002; Zimmer-Gembeck and Helfand 2008).

Objectives

The first goal of this study was to identify developmental trajectories of number of sexual partners assessed each year from ages 16–22. Based on the studies conducted by Lansford et al. (2010) and Zimmer-Gembeck and Helfand (2008), we expected to find at least three distinct trajectory groups. The first was expected to be characterized by sexual abstinence, the second by at least one partner, and the third by having several partners, and always having the most relative to the other groups.

The second goal was to examine individual (e.g., gender, pubertal timing, substance use, antisocial behavior, internalizing problems and social, and academic competencies) and family (e.g., family structure and parental monitoring) predictors (at ages 13–15) of trajectory group membership. We expected adolescents in the most extreme group to be more likely to have begun puberty earlier, be male, report higher levels of antisocial behavior, substance use and internalizing symptoms, have lower grades, not be living with both biological parents, and report lower parental monitoring than all the others groups. Given that academic competence and the parent-adolescent relationship can be understood as protective factors, we hypothesized that the middle group would report higher grades and greater parental monitoring, and live with both parents. Furthermore, we hypothesized that adolescents who reported zero partners would be characterized by less social competence than the other groups. Finally, we hypothesized that the groups characterized by both the lowest and highest number of partners would report the most internalizing symptoms.

Method

Participants

This longitudinal study began in 2001 with 390 Grade 6 students (58 % girls; mean age = 12.38 years; SD = .42) enrolled in eight elementary schools in a large French-speaking school district in Canada. Parents provided written consent for their child's participation. The sample was 90 % European Canadian, 3 % Haitian Canadian, 3 % Middle Eastern Canadian, 2 % Asian Canadian, and 2 % Latino Canadian. Seventy-two percent of the participants lived with both biological parents. Mean family income was

between US\$45,000 and \$55,000 (CAN), meaning that the sample was largely middle class given that this measure was taken in 2001. Mothers and fathers had completed an average of 13.10 (SD = 2.68) and 13.20 (SD = 3.20) years of schooling, respectively.

This study involved ten waves of data collection from ages 13–22. As in most longitudinal studies, there were missing data at different time points for different youth. Of the 390 youth initially recruited, 78 % were still participating at age 22 ($N = 303$). In order to be included in the trajectory analyses, participants had to have at least 3 data points out of 7 between the ages of 16 and 22. Fifty-eight participants were excluded. Among the non-excluded participants, 215 had 7 data points, 57 had 6, 26 had 5, 20 had 4, and 14 had 3. T -tests and χ^2 analysis revealed that the excluded participants reported more antisocial behavior, had lower grades and were over-represented by males compared to the non-excluded study participants ($N = 332$; 60.8 % girls).

Design and Procedures

In high school (ages 13–17), questionnaires were completed in the school setting under the supervision of research assistants. However, in some cases, assessments had to be conducted individually at the participant's home (approx. 10 per year) or questionnaires had to be sent by mail (approx. 5 per year). After high school (ages 18–22), assessments were conducted during a home visit by a research assistant. Parents provided written consent for their child's participation at each year of the study until the youth were 18. From ages 18–22, the participants provided written consent. Youth received a \$20 gift certificate for their participation at each time point.

Measures

Annual Number of Sexual Partners at Ages 16–22

Participants were provided with a definition of a complete sexual relation as including vaginal intercourse, and following this definition, they were asked with how many partners they had had over the course of the year. The wording of this item was different for males and females and referred to other-sex partners only. Males answered the question "Over the past year, how many different *girls* have you had as a sexual partner?" Females answered the question "Over the past year, how many different *boys* have you had as a sexual partner?" Participants were provided with a line on which to write their number of partners. This question was included each year in the questionnaire from ages 16–22. This method is consistent with what has been

done in the literature (Huang et al. 2012; Lansford et al. 2010; Moilanen et al. 2010).

Pubertal Timing at Age 13

Pubertal timing was assessed at age 13 using the Pubertal Development Scale (Peterson et al. 1988; see Verlaan et al. 2001 for French translation). On a scale ranging from 1 (has not begun) to 4 (development completed), the youth indicated the extent to which they had experienced pubertal growth in several domains during the previous 12 months. The total Pubertal Development Scale scores were averaged for each gender. Internal consistency was acceptable for both boys ($\alpha = .63$) and girls ($\alpha = .68$). The pubertal timing classification was created using the procedure recommended in the literature (Ge et al. 2003). Girls and boys were classified based on their respective position compared to the other participants in the sample, and rated as early-maturing, on-time, or late-maturing accordingly. Youth whose scores were more than one standard deviation above or below the mean for their own gender were classified as early- or late-maturing, respectively. Youth whose pubertal timing scores fell within one standard deviation of the mean for their own gender were classified as maturing on time. Following this classification procedure, 32 (19.2 %) boys and 26 (11.4 %) girls were classified as early maturers, 85 (50.9 %) boys and 157 (68.9 %) girls as on-time maturers, and 32 (19.2) boys and 23 (10.1 %) girls as late maturers. Pubertal status was used as a continuous variable in the analyses with three indicating early, two indicating on-time, and one indicating late pubertal development.

Family Structure

When providing demographic information, participants reported whether or not they lived with both biological parents. The responses for this item were dichotomous: yes or no.

All the other predictors were assessed at two time points, namely, when the participants were 14 and 15 years old. When the correlations between the two time points were sufficiently high ($>.40$), the two scores were combined and averaged to create a more reliable variable.

Substance Use

Alcohol use was measured using the item: "Over the past month, how many times did you drink alcohol with the intention of getting drunk?" Possible responses ranged from 0 to 10, followed by "11–20," "21–40," and "41 or more." Marijuana use was measured using the item: "Over the past month, how many times have you used marijuana or hashish?" Response options were the same as for alcohol use.

Correlations between marijuana and alcohol use were .54 and .34 at ages 14 and 15, respectively. The mean for marijuana and alcohol use was calculated for each time point. The correlation between substance use at age 14 and age 15 was .50. These two substance use scores were averaged to obtain a global substance use score. Since over 50 % of the sample reported either no use at all or less than monthly use, this variable was then split into tertiles with values of 0, 1, or 2. Scores of zero corresponded to non-users (25.9 % of the sample) and were coded as 0; scores higher than zero but lower than four (representing substance use four times a month) corresponded to light users (55.6 %) and were coded as 1; and scores of four and up (therefore weekly or more often) corresponded to heavy users (18.5 %) and were coded as 2.

Antisocial Behavior

Participants were asked to report on 16 items measuring antisocial behavior (Metzler et al. 1998; see Poulin et al. 2011, for French translation), rated on a 6-point Likert scale ranging from 1 (never) to 6 (more than 10 times). Examples of items included lying to parents, vandalizing public property, stealing, and fighting at school. A mean was calculated across the items ($a = .82$ at age 14 and $a = .78$ at age 15). A final score was obtained by averaging the scores for the two time points ($r = .69$).

Internalizing Problems

A 26-item French version of the Children's Depression Inventory (CDI; Kovacs, 1981 see Boivin et al. 1994, for French translation) was used to measure internalizing problems at ages 14 and 15. For each item, participants were asked to choose one of three statements that best described how they had felt over the previous 2 weeks (e.g., "I am tired sometimes"; "I am tired often"; "I am tired all the time"). Individual item scores ranged from 0–2, with higher ratings indicating more severe symptoms. A sum-score across all the items was calculated for each participant for each time point. The CDI has demonstrated good reliability and has been validated using normative and clinic-referred samples (Finch et al. 1985; Fundulis et al. 1991). Internal consistency was high for this sample (age 14 = .86; age 15 = .85). The final score for internalizing problems was obtained by computing the means for the scores at ages 14 and 15 ($r = .63$).

Social Competence

The social competence subscale of the Self-Perception Profile for Adolescents was used to measure this variable (Harter 1985; see Bouffard et al. 2002 for French

translation). Items assessed the extent to which the adolescents knew how to make friends, get others to like them and gain social acceptance. Each item presented the participant with two opposing statements (e.g. “Some teenagers find it hard to make friends” and “Some teenagers find it pretty easy to make friends”). After choosing which statement better reflected themselves, participants were asked to choose one of two options relaying the extent to which the statement described them (e.g. “Really true for me” or “Sort of true for me”). Thus, responses for each item were coded from one to four. Scores were then averaged, and internal consistency was high at both time points (.77 and .65). A final social competence score was computed by averaging the scores at ages 14 and 15 ($r = .53$).

Academic Competence

Academic competence was assessed using the participants’ grades (shown as percentages) in math and French, drawn from their school report cards at ages 14 and 15. All participants were enrolled in the same level of math and French, and grades were averaged to obtain a grade score for each time point ($r = .64$ at age 14 and $r = .62$ at age 15). The final grade score was obtained by averaging the scores for the two time points ($r = .71$).

Parental Monitoring

Participants completed Stattin and Kerr’s (2000; see Keijsers and Poulin 2013 for French translation) 9-item scale of parental monitoring knowledge at ages 14 and 15. The questions were scored on a 5-point Likert scale ranging from 1 (never) to 5 (often). These items measured the extent to which the participants’ parents were aware of their activities, whereabouts, and peer relationships (sample item: “Do your parents know what you do during your free time?”). The items were averaged and internal consistency was satisfactory at both time points ($\alpha s .85$ and $.84$). The final parental knowledge score was obtained by computing the mean for the two scores ($r = .63$).

Analytical Strategy

The first goal of this study was to identify trajectories of annual number of sexual partners from ages 16–22. Non-parametric growth mixture modeling was used to identify multiple trajectory groups (PROC TRAJ in SAS; Nagin 1999), and semi-parametric group-based modeling was used to model the trajectories. This technique assumes the heterogeneity of a specific variable (in this case, annual number of sexual partners) and sorts the sample into relatively homogenous groups. These groups are defined by their patterns of growth and the probability of group membership

is calculated for each participant. The participants are assigned to the trajectory to which they have the greatest probability of belonging and which best fits their personal trajectory.

While there is no standard way of dealing with outliers, one popular method involves identifying scores that fall beyond three standard deviations from the mean (Yates et al. 1999). We used this method and identified a maximum value for each time point. The maximum number of partners that could be reported without going beyond three standard deviations from the mean was seven partners. In order to manage outliers in the most conservative way, values of eight or higher were censored at seven partners throughout all seven waves. Scores of eight or higher were thus not disregarded or excluded, but merged at seven partners. In this way, partial information was retained for the outliers (i.e., that they were greater than seven). Therefore all scores fell between zero and seven. This method allowed for the inclusion of participants who had statistically extreme scores. It would not have been optimal to exclude these participants, as this would have disregarded an important, albeit small, subgroup of our sample. The percentage of participants whose scores were adjusted due to outlying values at each wave ranged from .3 to 2 %.

Semi-parametric group-based modeling is used to test multiple models that consist of a varying number of trajectories. When it comes to selecting the best model, the Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC) are the most informative indicators (Nagin 2005), followed by practical usefulness and theoretical relevance. Models with a good fit are represented by BIC and AIC values close to zero. To identify predictors of sexual trajectory group membership, analyses were carried out in two steps. First, group differences were examined by running univariate ANOVAs. Second, variables that had significant differences between the trajectory groups were entered in the multinomial logistical regression model.

Results

Identifying the Trajectories

We tested two-group, three-group, four-group, five-group and six-group models. Inspection of the models’ BIC and AIC values (presented in Table 1), as well their practical usefulness and theoretical relevance, resulted in the selection of the four-group model. In addition to showing the greatest BIC and AIC values, the four-group model was also the most coherent with our theoretical framework. As well as identifying the number of trajectories, our analyses also identified the shape of these trajectories, indicating the number of phases of increases or decreases in values (linear,

Table 1 Model selection using the BIC based on the number of participants ($n = 332$) and the AIC

Number of groups	BIC	AIC
2	-3343.95	-3328.73
3	-3259.84	-3235.11
4	-3216.55	-3179.50
5	-3216.70	-3182.46
6	-3209.81	-3167.96

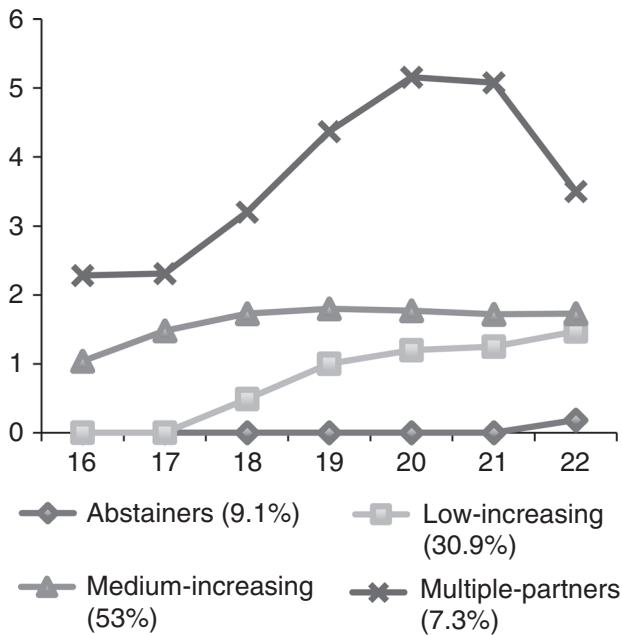


Fig 1 Developmental trajectories based on number of sexual partners from ages 16–22

quadratic, cubic). The probability that each participant had of belonging to each group was tested. These posterior membership trajectory probabilities represent the accuracy of the participants’ placement into their trajectory group. All posterior probabilities were greater than .5 and most were close to 1, which, according to Nagin (1999), represent appropriate values. Our final model consisted of four distinct trajectories of annual number of sexual partners (Fig. 1). The *abstainers* group (9.1%) reported zero partners throughout the majority of the period, followed by an average increase to one partner at age 22; the *low-increasing* group (30.6%) reported zero partners during the first two years, followed by an increase to one partner; the *medium-increasing* group (53.0%) reported one partner at age 16, followed by a slow increase, stabilizing at two partners; and the *multiple-partners* group (7.3%) reported two partners at age 16, followed by a steady increase which slowly decreased after a peak at age 20, although the number of partners remained higher than that reported by

the other groups at all times. All four trajectories had a cubic shape, indicating a common pattern of change.

Descriptive Statistics and Univariate Analyses of Trajectory Predictors

Descriptive statistics for each predictor as a function of trajectory group are reported in Table 2. Univariate ANOVAs were run for each variable to identify differences among the trajectory groups. Post hoc analyses using a Bonferroni correction were used to identify where the differences lay. χ^2 analyses were conducted for categorical variables. Several significant trajectory group differences were found and are reported in Table 2.

Males were overrepresented and underrepresented in the abstainers and medium-increasing groups, respectively. Participants in the medium-increasing trajectory reached puberty at a significantly earlier age than those in the low-increasing trajectory. Participants in the low-increasing trajectory group reported the fewest internalizing symptoms, and were significantly different from the other three groups, whereas the other three groups did not differ significantly from one another in this regard. The abstainers and low-increasing groups reported significantly less anti-social behavior than the medium-increasing and multiple-partners groups, and did not differ from one another in this regard. Participants in the abstainers group reported significantly less substance use than all the other groups. Moreover, the low-increasing group reported significantly less substance use than the medium-increasing and multiple-partners groups, while the latter groups did not differ from each other in this regard. Participants in both the abstainers and low-increasing trajectories reported significantly less social competence than those in the medium-increasing and multiple-partners groups, and did not differ from one another in this regard. Participants in both the abstainers and low-increasing trajectory groups reported significantly higher grades than those in the medium-increasing and multiple-partners groups, and did not differ from each other in this regard. No group differences were found with regard to whether or not the participants came from an intact family. Finally, participants in both the abstainers and low-increasing trajectory groups reported significantly higher levels of parental monitoring than those in the medium-increasing and multiple-partners groups, and did not differ from one another in this regard.

Multinomial Logistical Regression

To predict trajectory group membership, a multinomial logistical regression was run using all the variables that had significant differences at the univariate level (see Table 3). The same model was run three times using a different

Table 2 Means and standard deviations for antecedents, with comparisons by sexual trajectory group

Variable	Trajectory group			Group comparisons		Post hoc
	Abstainers (A; 9.1%)	Low-increasing (L; 30.6%)	Medium-increasing (M; 53%)	Multiple-partners (MP; 7.3%)	$F/\eta^2, \chi^2/V$	
Gender (% male)	56.3	42.2	32.4	52	$\chi^2(3, N = 332) = 9.393^*, V = .168$	
Pubertal timing at age 13	1.90 (.56)	1.86 (.58)	2.08 (.54)	2.04 (.56)	$F(3, 309) = 3.40^*, \eta^2 = .018$	L < M
Internalizing problems ages 14 and 15	7.70 (4.28)	7.65 (4.31)	10.07 (6.74)	9.65 (8.30)	$F(3, 291) = 3.60^*, \eta^2 = .04$	L < A, M, MP
Antisocial behavior ages 14 and 15	.08 (.07)	.13 (.09)	.20 (.12)	.24 (.15)	$F(3, 327) = 10.20^{**}, \eta^2 = .09$	A, L < M, MP
Substance use ages 14 and 15	.30 (.47)	.64 (.51)	1.14 (.61)	1.15 (.67)	$F(3, 291) = 26.79^{**}, \eta^2 = .22$	A, L < M, MP; A < L
Social competence ages 14 and 15	3.05 (.39)	3.23 (.43)	3.39 (.40)	3.57 (.36)	$F(3, 290) = 9.71^{**}, \eta^2 = .09$	A, L < M, MP
Academic competence ages 14 and 15	77.08 (10.18)	73.95 (9.77)	69.73 (9.38)	66.03 (9.53)	$F(3, 286) = 8.76^{**}, \eta^2 = .08$	A, L < M, MP
Intact family (%) at age 13	84.4	69.6	67.1	72	$\chi^2(3, N = 329) = 3.58, V = .104$	
Parental monitoring ages 14 and 15	4.11 (.63)	4.08 (.50)	3.70 (.69)	3.40 (.82)	$F(3, 291) = 11.56^{**}, \eta^2 = .12$	A, L < M, MP

* $p < .05$; ** $p < .01$

trajectory group as the reference each time, allowing every possible comparison to be examined. In the first regression, the multiple-partners group was used as the reference and compared to the three other groups. Less substance use increased the likelihood of belonging to the abstainers group as compared to the multiple-partners group. Lower levels of social competence also increased the likelihood of belonging to both the abstainers and low-increasing groups. No measures affected the likelihood of belonging to the medium-increasing group versus the multiple-partners group.

The second model compared the abstainers group to the low-increasing and medium-increasing groups. Females were more likely to belong to both the low-increasing and medium-increasing groups than to the abstainers group. Similarly, greater substance use also increased the likelihood of belonging to both the low-increasing and medium-increasing groups.

In the final model, the low-increasing group was compared to the medium-increasing group. Earlier puberty increased the odds of belonging to the medium-increasing group versus the low-increasing group. Moreover, both greater substance use and social competence increased the likelihood of belonging to the medium-increasing group as compared to the low-increasing group.

Discussion

Adolescents do not all experience sexual development in the same way. For some, early sexual behavior is associated with potential risks and subsequent health outcomes, such as greater chances of sexually transmitted infections and more condomless sex (Siebenbruner et al. 2007). For others, early sexual experiences may act as stepping stones to a healthy adult sexuality and can therefore be seen as normative (Tolman and McClelland 2011). This study had two objectives: to identify and describe sexual trajectories from ages 16–22 based on the annual number of sexual partners, and to examine whether individual and family predictors assessed at ages 13–15 predicted trajectory membership. Four distinct trajectories were identified. These trajectories differed with regard to the number of partners reported at age 16 (baseline), as well as the rate of change over time (slope). In short, individual factors (gender, pubertal timing, substance use and social competence) predicted group membership, whereas family factors did not. Below, we describe the study’s findings in greater detail and discuss their developmental significance.

Identifying Trajectories

Based on Zimmer-Gembeck and Helfand’s (2008) multiple-pathways model of sexual development as well as Lansford

Table 3 Multinomial regression predicting sexual trajectory group

Variable	Comparison group					
	Multiple-partners vs.			Abstainers vs.		Low-increasing vs.
	Abstainers OR	Low-increasing OR	Medium-increasing OR	Low-increasing OR	Medium-increasing OR	Medium-increasing OR
Male	3.06	.91	.56	.30*	.18**	.61
Pubertal timing	.62	.67	1.21	1.10	1.98	1.80*
Internalizing problems	1.06	.99	1.02	.93	.97	1.04
Antisocial behavior	.36	.23	.54	3.17	2.10	2.34
Substance use	.14**	.48	1.70	3.32*	11.85**	3.57*
Social competence	.07**	.10**	.25	1.58	3.82	2.42*
Academic competence	1.09*	1.05	1.03	.97	.95	.98
Intact family	1.88	.69	1.03	.37	.5	1.37
Parental monitoring	1.26	2.43	2.06	1.92	1.63	.85

* $p < .05$; ** $p < .01$

et al.'s (2010) study, we expected to find three distinct trajectories of the annual number of sexual partners. Four trajectory groups emerged from the analyses. Participants in all trajectories except the abstainers group reported an increase in the number of sexual partners between the ages of 17 and 20. Consistent with Arnett's theory (2000), this may reflect a period of experimentation—including in the sexual domain—in late adolescence and early emerging adulthood, corresponding to the college years for most youth, characterized by more peer and dating involvement and less parental supervision. In the cultural context where this study was conducted, college refers to an educational institution preceding university or labor market entry. There is a growing line of research indicating that hook-ups and short-term sexual encounters are common at this age, and can serve as a context to develop one's sexual preferences and sense of self as a sexual partner (Allison and Risman 2014; Stinson et al. 2014). In all the trajectories except the abstainers group, this period characterized by an increase in the number of sexual partners was followed by a decrease or stabilization, possibly indicating greater involvement in stable monogamous romantic relationships in the twenties, as well as less time spent with peers (including new potential sexual partners) when entering the labor market or meeting the higher demands of university studies (Weaver et al. 2011).

Our findings present similarities and differences with those reported by Lansford et al. (2010), who covered the same period (ages 16–22) and used a similar assessment of sexual behavior (e.g., number of sexual partners in the previous year). Similar to Lansford et al.'s study, we identified several distinct trajectory groups, which replicated their findings. However, our results also differed from theirs in several respects. First, and importantly, we identified a group of abstainers that contained 9.1 % of our

sample. This group reported zero partners at six consecutive time points, followed by a mean of less than one partner at age 22. In comparison, Lansford et al.'s least active group was sexually inactive at the first time point only, before reporting a sexual partner at age 17. This stark divergence highlights an important difference in the two samples and brings attention to an important subgroup of the population that remains sexually inactive later than their peers (Boislard et al. 2016). Possible explanations for this finding are discussed further below. Second, at the other end of the continuum, our most active group was quite different from Lansford et al.'s. Our most active group demonstrated an increase in the number of partners from age 16–20, as well as reporting an average maximum of five partners. The most active group in Lansford et al.'s study reported a decrease in the number of partners from age 16–20, and an average maximum of 2.5 partners. Our results are consistent with the 2011 National Health Statistics Report, which found that 31.6 % of American females and 26.1 % of American males between the ages of 21 and 24 reported between three and six lifetime sexual partners. Moreover, 11.7 % of females and 18.1 % of males in the same age bracket reported between seven and fourteen partners. It is important to keep in mind that these sex gaps are probably inflated by the well-documented reporting bias in which females consistently tend to under-report, and males to over-report, their lifetime number of sexual partners in surveys (Boislard and Poulin 2015). Evidently, having more than three sexual partners is much more prevalent than Lansford's results suggest, and may be represented by our multiple-partners group, which nevertheless constitutes a small proportion of our sample (7.3 %). This group is of great interest for public health policies targeting sexual risk-taking among youth, especially with recent data reporting increases in gonorrhea and HPV in this age group (MSSS 2010).

The middle two groups also appeared to be qualitatively different from one another, above and beyond their quantitative features with regard to the number of sexual partners. The low-increasing group showed a pattern of initiating sexual relations at the average age of 17 and tending not to have more than one sexual partner over time. The medium-increasing group reported earlier sexual onset but showed the most stable trajectory, with more or less one sexual partner across time. These two groups differed from each other in terms of the timing of sexual onset, which provides additional support for the importance of examining both the trajectory *and* the timing of onset when investigating sexual development among youth.

In summary, the two groups at both ends of the continuum in our study (e.g., abstainers and multiple-partners) were more polarized than Lansford's groups. Although our abstainers and multiple-partners group corresponded to only 9.1 and 7.3 % of the sample, respectively, these individuals represented pathways not found in Lansford et al.'s study. In Lansford et al.'s study, the majority of the sample (65.8 %) was grouped into a single trajectory whereas our results present a more diverse picture of sexual development. One possible explanation for this divergence between the two studies may be cultural. In Quebec, women have their first child later than in the United States, at a mean age of 28.7 as compared to 26 (Pica et al. 2012). Quebec youth also tend to wait longer before getting married: only 2.9 % of individuals between the ages of 20–24 and 13.1 % between the ages of 25–29 were married in 2012 (Pica et al. 2012), as compared to 9.3 and 36.7 %, respectively, in the same year in the United States (United States Census Bureau 2011). These numbers represent significant differences in demographics among emerging adults, and these differences could begin to emerge during adolescence. Compared to American youth, fewer Quebec youth appear to follow the traditional model of marriage during emerging adulthood. As such, premarital sex is considered normative (Blais et al. 2009). While the traditional institution of marriage remains important for some youth, there appear to be more diverse pathways and relational configurations (Rodrigue et al. 2015), which may correspond to our trajectories at both ends of the continuum. While relatively small in number, these groups of individuals nevertheless experience very different life paths in terms of their sexual development.

Individual and Family Predictors

We compared our trajectory groups with regard to a series of individual and family predictors measured at a younger age. In a first step, univariate analyses revealed that the abstainers and low-increasing groups reported higher grades, less antisocial behavior and more parental monitoring than the other two groups. Results specific to

particular groups also emerged. Adolescents in the medium-increasing group reached puberty earlier than those in the low-increasing group, and were overrepresented by females. This is consistent with research showing that early-maturing adolescents, females in particular, become sexually active at an earlier age than their peers (Zimmer-Gembeck and Helfand 2008). Interestingly, the participants in this group did not report the most partners over time, thus bringing to light that early onset and multiple sexual partnerships are distinct and not always intertwined.

The low-increasing group reported fewer internalizing symptoms than all the other groups, which lends support to the idea that this group represents a normative pathway of sexual development. Moreover, while prior research has linked a greater number of partners with internalizing problems, it has also been found that abstainers show internalizing symptoms (Mazzaferro et al. 2006). It is possible that greater internalization makes these individuals less likely to approach others, and may indeed make them less attractive to potential mates, although this is speculative and would require further empirical investigation.

In a second step, multinomial logistical regressions were performed with all the variables that were significant in the univariate analyses. Only three of these variables significantly predicted group membership. First, participants who reported greater substance use were more likely to belong to the multiple-partners group than to the abstainers group. These results are consistent with prior literature showing that substance use is associated with earlier-starting adolescents and a greater number of partners (Boislard et al. 2009; Boislard and Poulin 2011), as well as with the decision to have sex, including casual sex or sex with multiple partners (Cooper 2002). Adolescents who use more substances may more often find themselves in social contexts with other-sex peers, such as bars or parties, and therefore have more opportunities to encounter potential sexual partners and engage in sexual behavior. Furthermore, sensation-seeking may explain these results as adolescents who have a higher threshold of arousal seek out more intense experiences to gain pleasure (Zuckerman 1990), and find the novelty of a sexual partner more attractive than individuals who do not present the sensation-seeking trait as strongly (Michel et al. 2006).

Second, and consistent with our hypotheses and with previous studies (e.g., Zimmer-Gembeck et al. 2004), the two higher groups reported more social competence than the other groups. Although we did not collect information on the reasons the abstainers group remained virgins (i.e., religious reasons, lack of desire, etc.), it can be theorized that a lack of social competence plays a role. A wave of recent research on adult virgins has found that the majority of them have never been in a romantic relationship and also report themselves as shy or incapable of establishing social

connections (Boislard et al. 2016). These findings also lend support to the notion that adolescent sexuality can be viewed as a positive step toward healthy adult sexual and romantic relationships. The groups that reported more partners also reported more social competence. This suggests that there may be some positive characteristics of adolescent sexuality. Adolescents may be able to explore their developing sexuality with the help of social skills that allow them to enter into romantic or sexual relationships. Conversely, adolescents who desire to engage in sexual activity but do not have the appropriate social competence may miss out on romantic or sexual opportunities. Third, sex also predicted membership when the abstainers trajectory was used as the reference group. Females were more likely to belong to the low-increasing and medium-increasing group as compared to the abstainers group. Indeed, females represented 67.6 % of the medium-increasing, 57.8 % of the low-increasing, and 43.7 % of the abstainer groups. Earlier-maturing girls tend to engage in sex at an earlier age than their peers, which could explain why they were overrepresented in one of the groups that already reported a partner during the first wave.

Altogether, our results support Zimmer-Gembeck and Helfand's multiple pathways of sexual development model in that distinct groups were identified and associated with different antecedents. The abstainers group reported less substance use than all the other groups, as well as being overrepresented by males compared to the low-increasing and medium-increasing groups. Overall, the abstainers showed a pattern of "not-doing" that extended beyond the sole domain of sexual activities, as they also abstained from substance use more than those in the other trajectories, a pattern that was also revealed in previous qualitative studies (Mullaney 2006). The low-increasing group differentiated itself by reporting the fewest internalizing problems, as well as less substance use than the medium-increasing and multiple-partners group, but more substance use than the abstainers. The overall stability of their pattern could be due to their involvement in a single and lasting romantic relationship with their first partner starting around age 17, which may result from—and consolidate—the absence of internalizing symptoms (Coyne 1976a, b). The medium-increasing group reached puberty earlier than all the other groups, and was over-represented by females. This result is in line with the literature indicating that early-maturing females are also more likely to initiate sexual relations at an earlier age (Boislard et al. 2016), while also adding to our current knowledge by revealing their possible stable involvement with one partner over time. Finally, the multiple-increasing group was characterized by having more than two partners throughout the period under study, as well as a peak of five partners at age 20. Much research has been conducted on youth who are involved in sexual

risk-taking such as the participants in this group; yet, they represented a minority (7.3 %) among the multiple sexual trajectories that this study brought to light. As such, a new wave of research on adolescent sexuality has attempted to tease apart deviant behaviors from more normative ones, and our results add to this literature. Indeed, our results imply greater diversity in sexual development than proposed in the multiple pathway model since we identified two, albeit relatively small, groups at the two ends of the continuum (abstainers and multiple-partners groups) in addition to two larger and more moderate groups (low-increasing and medium-increasing groups).

Strengths and Limitations

The strengths of this research include the longitudinal design and yearly data collection from the ages of 12–22 with a low attrition rate. Moreover, most of our predictor variables were averaged over two years, rather than measured at a single time point, resulting in more reliable scores.

This study also had some limitations. First, there was a sexuality bias in that participants were asked only about relations with persons of the other sex and not about potential relations with persons of the same sex. However, the development of sexual identity follows different trajectories for sexual-minority youth as compared to their heterosexual peers (Boislard et al. 2016). Merging all youth regardless of their sexual orientation could have increased the variance but might have created confusion in the interpretation, especially because there may not have been enough same-sex attracted participants to allow further comparisons in the trajectories. Second, participants were not asked to supply the names of their partners. It is possible that some participants had the same partners over multiple time points. This may skew the data in terms of the riskiness of sexual behavior. For example, a participant reporting the same partner over the span of several years does not represent the same level of risk as a participant who reports a different partner each year. Using our methodology, these two participants would be classified in the same group even though they might actually be quite different from one another. The third limitation involves the heavy reliance on youth self-report. Although school report cards (for academic competence) were collected, the other predictors and annual number of sex partners were all based on self-reports. This may artificially inflate estimates because of monomethod bias. Fourth, it would have been instrumental to examine the potential moderating role of gender as prior studies have found interactions between internalizing and antisocial behavior and sexuality in boys but not in girls (Boislard et al. 2013). This analysis was not possible due to our small sample size, and future longitudinal studies with

larger samples should be sure to examine this effect. Finally, the current study used a fairly homogenous sample of adolescents from a single geographical area and should be replicated with more ethnically diverse samples.

Now that more research has provided support for the notion that sexual development is not the same across the board for all adolescents, it is important to produce similar studies to replicate these findings. Future studies could also examine the potential consequences of belonging to these different trajectory groups, such as effects on later sexuality or romantic relationship satisfaction. If early sexual experiences provide a foundation on which individuals learn to navigate healthy sexuality and romantic relationships, it can be speculated that those who have had no experience as well as those with erratic experience may be at a disadvantage during emerging adulthood. Undesired sexual inexperience may produce a variety of negative consequences, such as low self-esteem or depressive symptoms. Conversely, a more turbulent sexual development may contribute to problems with intimacy or attachment within a romantic relationship.

Conclusion

In the same way that early romantic relationships shape later ones, it appears likely that early sexual experiences have an effect on adult sexuality. Much prior research has focused on identifying early risk factors of subsequent sexual risk behavior. It is equally important, however, to identify the strengths and competencies associated with healthy sexual development, which can then be fostered and nurtured in young adolescents.

Youth risky sexual behaviors, commonly operationalized as precocious intercourse, non-systematic condom use, and multiple sexual partners (Boislard et al. 2009), are directly involved in the high prevalence rates of STIs, including HIV (Brener et al. 2006). Although research on adolescent risky sexual behavior is of vital importance, over the past two decades, it has been increasingly recognized that the exploration of intimate relationships and sexual behaviors during adolescence and emerging adulthood is not inherently risky per se. Youth sexuality's research agenda is now taking both its normative and risky components into account, focusing on promoting positive sexual health (Diamond 2006; Zimmer-Gembeck et al. 2011) and preventing sexual health issues such as STIs and HIV, unplanned pregnancies, sexual coercion and abuse, and violence in romantic young people. This is also in line with the World Health Organization's (WHO 2006) claim that sexual health is not merely the absence of illness or sexual problems, but also encompasses physical, mental, emotional, and social well-being in relation to sexuality.

Authors' Contributions This research was conducted as part of ER's doctoral dissertation. ER performed the statistical analysis, interpreted the data, and drafted the manuscript. FP conceived of the study, its design, its coordination, participated in the interpretation of the data and helped to draft the manuscript. MAB participated in the interpretation of the data and helped to draft the manuscript. All authors read and approved the final manuscript.

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Compliance with Ethical Standards APA human subjects guidelines were followed in the collection of data.

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval This study have been approved by the appropriate institutional research ethics committee.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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Erika Rossi has a bachelor in psychology from Concordia University in Montreal. She is currently completing her doctoral studies at the Université du Québec à Montréal. Her research interests include psychosocial adjustment in adolescents and emerging adults, as well as social and sexual development.

François Poulin received his Ph.D. in developmental psychology from Université Laval in Québec City. He conducted post-doctoral research at the Oregon Social Learning Center at the University of Oregon. He is currently a full professor in the psychology department at Université du Québec à Montréal. His research interests include peer relations and adjustment from childhood to emerging adulthood, participation in organized activities, and the prevention of adjustment problems.

Marie-Aude Boislard, Ph.D., is an associate professor at the Department of Sexology at Université du Québec à Montréal. Her research focuses on various aspects of psychosexual development of adolescents and emerging adults, such as sexual risk-taking, sexual fluidity and desynchronized sexual trajectories (i.e., early onset, late onset, adulthood virginity).