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Deconstructing Heterogeneity in Adolescent Sexual Behaviour:
A Person-Centered, Developmental Systems Approach

by

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ABSTRACT

This study examined heterogeneity in adolescents' experimentation with partnered sexual behaviours. Participants were 88 high school students in Edmonton, Alberta (*M* age = 16.59, *SD* = .95). Students completed surveys online once per two months from December, 2008 through December, 2009. Surveys tracked students' reports of seven sexual behaviours ranging in intimacy from holding hands to intercourse. Growth mixture models were used to sort students' trajectories of sexual behaviours across months into latent classes based on similar profiles. The best-fitting model revealed three distinct classes, labeled *inexperienced*, *experimenting*, and *experienced*. Students classified as inexperienced primarily reported only lower-intimacy, non-genital sexual behaviours across months, and many reported no sexual behaviours. Students classified as experimenting and experienced reported similar levels of higher-intimacy sexual behaviours across months. Most experimenting students' behaviours appeared to increase gradually from less to more intimate, whereas experienced students appeared to make abrupt transitions between lower- and higher-intimacy behaviours, month-to-month. Demographic, personal, peer, and family variables provided additional information that increased distinction among classes, and explained residual within-class heterogeneity. The probability of being classified as inexperienced was highest for students who were younger, reported fewer sexually experienced friends, and lower parent behavioural control. Students who reported higher parent behavioural control had the highest probability of being classified as experimenting. Relations between trajectories of

sexual behaviour intimacy and risk factors (e.g., later pubertal timing, fewer problem behaviours) and protective-enhancing resources (e.g., higher psychosocial maturity, more intimate friendships) varied across classes. This study shows that there are multiple pathways of experimentation with sexual behaviour in adolescence. Results are consistent both with studies that emphasize the potential for sex in adolescence to be high-risk, and with studies and arguments that emphasize the potential for sex in adolescence to play an important preparatory role toward healthy adult sexual functioning. Theoretical arguments and discussion are guided by a person-centered, developmental systems approach.

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CHAPTER I

Introduction and Literature Review

This chapter contains a review of literature that is relevant to understanding and explaining heterogeneity in adolescent sexual behaviour. In the first section, descriptive data about adolescent sex are examined, and two perspectives used to study adolescent sexual behaviour are introduced: (1) adolescent sex is high-risk, and (2) adolescent sex is normative. Developmental systems theory is offered as a framework for refining the ideas of both perspectives, with emphasis on a person-centered approach to analyzing heterogeneity in adolescent sexual behaviour. This study combines elements of the high-risk and normative perspectives on adolescent sex, simultaneously examining the role of risk and protective-enhancing factors in explaining heterogeneous patterns of adolescent sexual behaviour.

Adolescent Sexual Behaviour

Adolescence is a period of the lifespan that is fundamental to a complete understanding of human sexuality, as it is the originating period for several aspects of sexual development. The physical maturational changes associated with puberty usually begin around age 8 for girls and age 9 for boys (Susman & Rogol, 2004), leading to sexual interest and experimentation with partnered sexual behaviours, accompanied by the task of acquiring physical and emotional intimacy (DeLamater & Friedrich, 2002; Collins & Sroufe, 1999).

Most people first engage in sexual intercourse during adolescence (Michael, Gagnon, Laumann, & Kolata, 1995), and most research on adolescent

sexual behaviour has focused exclusively on the antecedents, consequences, and covariates of intercourse. Sexual intercourse is sometimes framed as a transitional event in adolescent development, when adolescents move from being sexually inexperienced (virgin) to sexually experienced (non-virgin) (Jessor & Jessor, 1975). Broad interest in sexual intercourse has generated a wealth of nationally representative, descriptive data about the prevalence and characteristics of intercourse in adolescence. In a nationally representative census of adolescent sex, 46% of American youth aged 15-19 reported engaging in sexual intercourse at least once in their lives (Abma, Martinez, Mosher, & Dawson, 2004). About one third of those aged 15-17 and about two thirds of those aged 18-19 reported ever engaging in sexual intercourse. Among sexually active adolescents, two thirds reported having only one intercourse partner during the preceding year. More older adolescents reported multiple partners, but fewer than 12% of sexually active adolescents at any age reported accumulating four or more partners in the preceding year. About half of sexually active adolescents reported using a condom during their last occasion of intercourse, but 17% reported using no method of contraception. Similar statistics were found for intercourse experience, number of partners, and contraceptive use among Canadian adolescents, although fewer Canadians reported using no method of contraception (McKay, 2004).

These descriptive data suggest that there are significant risks (i.e., pregnancy, sexually transmitted infection) associated with sexual intercourse during adolescence. This potential for risk is the foundation of the first of two perspectives on adolescent sex discussed in the following sections. From the first

perspective, adolescent sex carries significant health risks and is often associated with problems in other domains of development. Proponents of this perspective encourage abstinence and delay of sexual intercourse as strategies for preventing negative health consequences. The main emphasis of the second perspective, in contrast, is that sex is a normal part of adolescent development. Healthy, low-risk experimentation with sex (i.e., few partners, consistent condom use) can be associated with success in other domains of development. Proponents of this perspective encourage making healthy sexual choices as a strategy for preventing negative and promoting positive health and developmental outcomes.

Perspective I: Adolescent sexual behaviour is high-risk. It is normal to experiment with sexual behaviours during adolescence, but adolescents tend to be inconsistent contraception users (Franzetta, Terry-Humen, Manlove, & Ikramullah, 2006), accumulate multiple partners with dating experience (Feldman, Rosenthal, Brown, & Canning, 1995), and, as dependents, may be financially and psychologically ill-equipped to deal with the consequences of an unintended pregnancy. About 25% of sexually experienced American adolescents aged 13-19 acquire a sexually transmitted infection (STI) each year (Moore & Rosenthal, 2006). In addition, young people aged 15-24 account for 48% of all new cases of STI annually in the United States (Weinstock et al., 2004). It is reasonable, therefore, to assume that engaging in sexual intercourse has some risks in adolescence.

Sex is often placed in the same category as other behaviours that are permitted in adulthood but proscribed in adolescence, such as driving a car or

drinking alcohol. The similar risk pattern of these and other behaviours is the basis of *problem behaviour theory* (Jessor & Jessor, 1975). According to problem behaviour theory, sexual intercourse is an example of a behaviour that marks a transition in development. Other behaviours include drinking alcohol for the first time, getting a driver's license, and taking on a first job. What these transitions have in common is that they are permitted or even encouraged in late adolescence and adulthood, but proscribed in childhood and early- to mid-adolescence. Jessor and Jessor defined problem behaviour, or deviance, simply as proneness to making these age-graded transitions prior to a normative developmental timeline. The transition to "non-virginity", therefore, is deviant if it takes place at a young age.

In their longitudinal study of high school students, Jessor and Jessor (1975) found several personality, environment, and behaviour differences between virgins and non-virgins. Non-virgins, for example, reported more deviant behaviour (alcohol and drug use, delinquency), lower levels of parent support and control, and more peers who modeled and approved of deviant behaviour. They argued that these kinds of patterns could be expected to emerge for the entire class of transitional behaviours that, when initiated too early, constitute deviance.

By proposing their theory, Jessor and Jessor (1975) launched an entire literature in which adolescent sex was presented as belonging to a class of problem behaviours. Subsequent studies showed that early sex in adolescence was associated with using drugs and alcohol (Bohon, Garber, & Horowitz, 2007; Cleveland, 2003; Hellerstedt, Peterson-Hickey, Rhodes, & Garwick, 2006; Kim-

Godwin, Clements, Bullers, Maume, & Demski, 2007; Rosenthal, Smith, & de Visser, 1999; Woody, Russell, D'Souza, & Woody, 2000), having deviant peers (Capaldi, Stoolmiller, Clark, & Owen, 2002; Costa, Jessor, Donovan, & Fortenberry, 1995; Whitbeck et al., 1999), poor academic achievement, lower expectations, and lower marks in school (Bingham & Crockett, 1996; Martin et al., 2004; Vesely et al., 2004), poor communication with parents (Karofsky, Zeng, & Kosorok, 2001), and less parent supervision (Borawski, Ievers-Landis, Lovegreen, & Trapl, 2003; Henderson et al., 2002; Rai et al., 2003; Wilder & Watt, 2002).

Longitudinal evidence also supports problem behaviour theory. Family, peer, and behavioural variables predicted early initiation of intercourse in several longitudinal studies: Adolescents whose mothers worked longer hours (Mott et al., 1996) and whose parents engaged in less monitoring (French & Dishion, 2003) initiated intercourse at earlier ages. Adolescents who had deviant peers (Costa et al., 1995; French & Dishion, 2003), peers with lower academic achievement (Meschke et al., 2000), peers who were sexually experienced (Kinsman et al., 1998) and who reported peer pressure to be delinquent (Raffaelli & Crockett, 2003) initiated intercourse at earlier ages. Adolescents who used drugs and alcohol and engaged in delinquent behaviour (Capaldi et al., 1996; Costa et al., 1995; French & Dishion, 2003) also initiated intercourse at earlier ages.

One study of rural adolescents followed from Grades 9 through 12 found similar effects to those noted above (Bingham & Crockett, 1996). Students who

initiated sexual intercourse early (before about age 15) showed increases over time in problem behaviours (delinquency, drunkenness, drug use) and decreases over time in educational aspirations and grades. After controlling for psychosocial adjustment (e.g., self-esteem) measured prior to first intercourse, however, early intercourse no longer predicted adverse outcomes in any of the measured domains. Contrary to problem behaviour theory, this study showed that early sex might not be a problem behaviour *per se*. Many risk factors may increase the odds of initiating sexual intercourse at a young age, but it is also possible that some adolescents who initiate intercourse at young ages exhibit no problems in other domains.

Other results that contradict the risk perspective appeared in studies aimed at identifying problems associated with adolescent sex. In addition to problems, initiating intercourse was associated with higher body pride (Lammers et al., 2000) and higher self-esteem (Paul et al., 2000). Furthermore, one study showed that initiating intercourse at older ages might be problematic. In that study, people who initiated intercourse after age 18 reported lower subjective well-being and were less likely to have close friendships (Haase, Landberg, Lüdke, Schmidt, & Silbereisen, 2010).

Clearly, there are health risks associated with sexual intercourse in adolescence, and adolescents who initiate intercourse very young – before about age 14 or 15 – often exhibit personal, peer, and family problems that may interfere with successful development. Unfortunately, the dominance of the risk perspective and preponderance of studies linking adolescent sex almost

exclusively to problems has contributed to a narrow view of the role of sexual behaviour in adolescent development. In their meta-analysis, Zimmer-Gembeck and Helfand (2008) concluded that an important next step for longitudinal research on adolescent sex should be to differentiate patterns of sexual behaviour that are developmentally maladaptive from patterns that reflect normative experimentation, potentially concurrent with short-term problems but not necessarily predictive of long-term dysfunction. The next section presents an alternative to the risk perspective that is gaining momentum.

Perspective II: Adolescent sexual behaviour is normative. There is ample evidence that sexual behaviour in adolescence can be risky, and it is important to identify strategies for limiting adolescents' risks. Nevertheless, the majority of adolescents initiate intercourse by age 18, suggesting that STIs and unplanned pregnancies are exceptional rather than typical consequences of sex in adolescence. Although some adolescents' sexual activities may be associated with negative social, psychological, and behavioural consequences, other adolescents' sexual activities may be steps on a path toward healthy adult sexuality. Most researchers, however, have either framed their studies of adolescent sex from the risk perspective or have studied processes of change in specific sexual risk behaviours (e.g., inconsistent condom use, multiple partners). Virtually no studies emphasize the potential for adolescent sexual behaviour to be an important preparatory step toward sexual competence in adulthood (Ehrhardt, 1996).

Political motivations to perpetuate the view that adolescent sexuality is like a disease help to maintain an imbalance in sex research that emphasizes risks

and ignores the role of healthy sexuality in promoting positive developmental outcomes (Ehrhardt, 1996; Savin-Williams & Diamond, 2004; Tolman & Diamond, 2001). In 1991, the U.S. Secretary of Health and Human Services rescinded an offer of funding from the National Institutes of Health to a study that included survey questions about the nature and context of adolescent sexual behaviour. The rationale for this decision was based on a belief that "the study would inadvertently convey a message that would be counterproductive to our efforts to discourage casual sex among teenagers" (personal communication cited in Gardner & Wilcox, 1993, p. 973). Although some sexual behaviour and romantic relationship survey items eventually appeared in what is now the National Longitudinal Study of Adolescent Health, the consequences of this interference resonate today as researchers continue to feel pressure to devise strategies for preventing or delaying adolescent sex. Indeed, Tolman and Diamond (2001) noted that researchers who have attempted to articulate the emotional and relationship contexts and processes associated with sex in adolescence have had their work eclipsed by studies of the types and frequencies of specific sexual risk behaviours. Preventing negative consequences associated with sex in adolescence is an important goal, but so is it important to determine what aspects of adolescents' sexual behaviours, desires, and relationships contribute to healthy sexuality in adolescence and throughout the lifespan. From a clinical practice perspective, Wright (1998) argued in favour of emphasizing ways in which sexual behaviours are normal, and de-emphasizing the relation between

sex and pathology to promote open dialogues between young people having sex and the clinicians and researchers with whom they work.

Sexuality researchers agree that it is no longer acceptable to focus exclusively on the disease-prevention aspects of adolescent sexuality (Ehrhardt, 1996; Halpern, 2010; Russell, 2005; Savin-Williams & Diamond, 2004; Tolman & Diamond, 2001). They further agree that research is needed to devise strategies to help adolescents choose healthy sexual behaviours as an early step toward "safe, competent and fulfilling sex lives … as they move through the life course" (Halpern, 2010, p. 6). This consensus, however, has not yet translated into programmatic lines of research. Results of the few studies that have focused explicitly on the normative aspects of adolescent sexual behaviour support the notion that adolescent sex can have positive implications. For example, He et al. (2004) found that high school students who reported consistently using condoms and having a single partner over the past few months had higher grades and reported lower stress than students who engaged in riskier sexual behaviours.

Healthy and low-risk sexual behaviour in adolescence may also contribute to healthy sexual development. In a study of Grade 12 girls, Impett and Tolman (2006) found that students who tried a broad range of sexual behaviours (e.g., kissing, genital touching, intercourse) viewed their own sexual desires, interests, and behaviours more positively than less experienced students. These positive views were related to more satisfying sexual experiences, characterized by positive affect, closeness to one's partner, and more positive body image. Similarly, Horne and Zimmer-Gembeck (2005) found that high school and

university women who engaged in sexual intercourse reported higher body esteem, more positive feelings about their sexual desirability, and greater entitlement to sexual pleasure from their partner, compared to women who engaged in other genital-stimulating behaviours but not intercourse.

Studies reviewed here that constitute both perspectives of the adolescent sexual behaviour literature lack cohesion, because research has proceeded in the absence of a unifying theoretical framework to guide scholars toward an organized and systematic study of adolescent sexuality. Problem behaviour theory (Jessor & Jessor, 1975) is a framework referenced by many scholars interested in describing adolescent sexual behaviour in terms of risk-proneness and adverse outcomes. Sexual health is a term frequently invoked as a framework for studying adolescent sexual behaviour (Haffner, 1998; Sandfort & Ehrhardt, 2004), but is limited in its culture-specificity, focus on risk prevention, and lack of guidance on the role of influential contexts of adolescents' lives in promoting healthy sexuality. Some of these limitations are addressed in feminist models of sexual health (Tolman, 1999; Tolman, Striepe, & Harmon, 2003), but feminist scholars emphasize healthy sexuality as a life course achievement, independent of other domains of functioning.

To the extent that healthy sexuality is a central component of general well-being throughout the life course, Halpern (2010) argued that adolescent sexuality must be viewed as a relational, developmental process in order to move the field of study forward. To illustrate the usefulness of a theoretical approach that emphasizes developmental processes, consider that puberty is a universal

biological event that permits sexual maturity and reproductive capacity. Virtually all people go through puberty, but the relations between its physical manifestations and the familial, social, and cultural reactions it generates determine how individuals think about and act on their sexuality (Sameroff, 2010). For example, the task of navigating romantic relationships and sexual interest in adolescence will take on a very different form in cultures that proscribe adolescent sexual behaviour compared to those that permit or encourage it.

A theoretical approach that emphasizes developmental processes is reviewed in the next section, followed by a discussion of how research on adolescent sexual behaviour is informed by this approach. A person-centered analytic strategy for identifying high-risk versus normative patterns of experimentation with sexual behaviour in adolescence is proposed.

Developmental Systems Theories and Sexual Behaviour

In formulating a theoretical framework for studying adolescent sexual behaviour, the first point to acknowledge about adolescence is that it is characterized by substantial interindividual differences and intraindividual change (Lerner et al., 2001). In other words, normal adolescents experience changes over time in many domains of life, and the nature of these changes varies from person to person. Sexuality is a domain that is particularly sensitive to this variation and diversity. First sexual intercourse, for example, is a single transitional event that varies in its timing (e.g., at ages ranging from 10 or younger to the mid-twenties and older), reasons for delay (e.g., religious beliefs), and risk factors that predict early intercourse (e.g., deviant peers).

Developmental systems theories are useful in understanding variation and diversity in adolescents' experiences with sexual behaviour. The central, metatheoretical proposition that guides research based on developmental theory is that relations between individuals and their family, peer, societal, and other contexts produce developmental change (Gottlieb, 1991; Gottlieb & Halpern, 2002; Lerner, 1998; Lerner & Kauffman, 1985). In other words, cognitions, emotions, genetic imperatives, and environmental events do not work in isolation to produce developmental change (Gottlieb, 1991).

The proposition that *person-context relations* produce development is one of four assumptions underlying developmental systems theories (Lerner, 1998). Other assumptions are that individual development exhibits *relative plasticity*, or the potential for change across the lifespan; *temporality*, the idea that change is a defining characteristic of development due to individuals' embeddedness within historical contexts; and *diversity*, the idea that individuality and individual differences promote variability in the person-context relations that produce development. Developmental systems theories, therefore, emphasize diversity in processes of changing person-context relations over time (Lerner et al., 2001).

Probability plays a role in refining the assumptions of developmental systems theories. Person-context relations in development are not deterministic, and behaviours do not emerge according to invariant or inevitable timetables based on prior knowledge of contextual conditions. Relative to group norms, some individual pathways are more likely than others, given the specific person-context relations driving developmental change. This is *probabilistic epigenesis*

(Gottlieb, 1991). As development proceeds, the potential for plasticity in development narrows as individuals organize themselves around their contexts, and the probability of observing divergent developmental pathways is reduced. People take an active role in shaping their contexts, just as contexts exert shaping influences on people and their developmental pathways (Lerner & Kauffman, 1985).

The assumptions of developmental systems theories capture many aspects of adolescent sexual behaviour. Adolescents' decisions to engage in partnered sexual activities are driven by relations between personal readiness and desire, peer group and family expectations, and the moral imperatives of adolescents' societies, among other influences. Furthermore, the structure and function of these relations change as adolescents age. Gaining experience by experimenting with sexual behaviours influences the probability that similar behaviours will be repeated in the near or distant future, with the same and other partners. Finally, the ways in which person-context relations influence adolescents' decisions to engage in sexual behaviours or not, or to change the types of behaviours they practice, are a function of individual differences.

Lerner et al. (2001) recommended that adolescent research following the assumptions of developmental systems theories include three features: (1) Measures of individual differences, (2) research designs, measures, and analyses that are change-sensitive, and (3) models that capture person-context relations that are theoretically relevant to the substantive field of study. This study is guided by a developmental systems approach by examining patterns of adolescent sexual

behaviour across months, how patterns vary as a function of personal, peer, and family diversity, and whether adolescents can be organized into groups that reflect qualitative differences in the ways that sexual behaviours, relative to demographic, personal, peer, and family differences, are expressed over time.

Principles of developmental systems theories are extended in the next section to the issue of appropriate measurement of adolescent sexual behaviour. The strategy of ordering multiple sexual behaviours from least to most intimate is presented as an alternative to traditional methods of contrasting virgin and non-virgin adolescents.

Sexual behaviour intimacy. A limitation of the adolescent sexual behaviour literature is the disproportionate number of studies in which the only measure of sexual behaviour refers to sexual intercourse, despite the rich variety of non-coital behaviours that constitute adolescents' sexual experiences. Experience with intercourse is measured in several ways: (1) as a virgin-nonvirgin dichotomy, contrasting people who have never tried intercourse with people who have tried intercourse at least once; (2) by recording the ages at which participants report first engaging in sexual intercourse (prospectively and retrospectively); (3) by frequency of occasions of intercourse across days, months, or years; and (4) by classifying people's level of sexual risk, based on self-reports of condom use consistency, number of intercourse partners, and use of drugs and alcohol concurrent with sexual events. Sampling from the full range of adolescents' sexual behaviours permits observation of individual differences in the sexual experiences of adolescents who have not yet engaged in sexual intercourse;

focusing exclusively on intercourse treats these adolescents as a homogeneous group.

Studies of non-coital sexual behaviours (e.g., kissing, touching, manual and oral genital contact) are slowly emerging as sex researchers recognize the prominence and relevance of these behaviours in adolescents' sexual repertoires. Oral sex garnered attention when researchers became aware that adolescents might be using it as an alternative to intercourse. Newcomer and Udry (1985) described it as an effort on the part of girls to retain their "technical virginity," and to avoid the potentially unpleasant emotional and physical consequences of intercourse. Indeed, avoiding risks associated with intercourse was one of the reasons to engage in oral sex most frequently reported by Grade 9 adolescents in one study (Cornell & Halpern-Felsher, 2006). In several studies, more adolescents reported experience with oral sex than vaginal intercourse (Boekeloo & Howard, 2002; Halpern-Felsher et al., 2005; Lindberg et al., 2008; Prinstein et al., 2003), adolescents used condom and barrier protection methods less consistently for oral sex (Boekeloo & Howard; Prinstein et al.), and perceptions of risks and consequences differed for oral sex compared to intercourse. Halpern-Felsher et al. showed that Grade 9 adolescents associated fewer social, emotional, and physical risks with oral sex compared to intercourse, and viewed oral sex as a more age-appropriate sexual behaviour than intercourse. Brady and Halpern-Felsher (2007) found that Grade 9 adolescents who had tried oral sex at least once associated fewer negative and positive emotional consequences, such as guilt and pleasure, with oral sex compared to intercourse.

There are few studies of other non-coital sexual behaviours, but those available suggest differences between adolescents who report different behaviours. In a sample of adolescents in Grades 9 through 12, Schuster et al. (1996) examined virgins' sexual experiences and placed them in categories based on the most intimate non-coital behaviour they reported: (1) none, (2) genital touching, and (3) oral sex. Higher rates of substance use and other problem behaviours (e.g., skipping class) were associated with more intimate non-coital sex. In contrast, adolescents in a different study who abstained from all genital contact reported fewer dating opportunities, lower socioeconomic status, and lower grades than adolescents who abstained from intercourse but engaged in non-coital activities such as genital touching and oral sex (Woody et al., 2000). In a daily diary study of adolescent women, Hensel et al. (2008) showed that sexual occasions that included non-coital activities in addition to intercourse were associated with more sexual interest, higher levels of partner support, and more positive mood than sexual occasions involving intercourse alone.

Clearly, there are differences among adolescents who try certain sexual behaviours and not others, and studying adolescents' non-coital behaviours may shed light on important differences in developmental processes as they approach first intercourse (O'Sullivan & Brooks-Gunn, 2005). Given the lack of directed research on non-coital sexual behaviours, however, there is no consensus over the practical meaning of these differences for sexual health education, intervention programming, or evaluation of adolescents' levels of sexual risk. Indeed, the contrasting results of the Schuster et al. (1996) and Woody et al. (2000) studies

speak to the importance of including measures of a variety of sexual behaviours in research on adolescent sex.

One strategy may be to think about sexual behaviours as lying on a continuum ranging from least intimate to most intimate activities. Indeed, the practice of ordering sexual behaviours from least to most intimate has a long history in the clinical and psychiatric research literatures on sexuality. Podell and Perkins (1957) showed that sexual behaviours can be reliably ordered using Guttman scaling principles (i.e., people who report that they engaged in more intimate behaviours should also report that they engaged in all less intimate behaviours). Later, Bentler (1968a; 1968b) evaluated the reliability and validity of an ordinal scale of sexual behaviours, ranging from least to most intimate. Cross-validation and internal consistency estimates in separate samples of men (1968a) and women (1968b) supported a rank-ordering of 21 behaviours, ranging from kissing (least intimate) to oral sex (most intimate). In a more recent study of the validity of a 15-behaviour scale, Geer and Broussard (1990) found that oral sex was ranked lower than sexual intercourse by 80% of participants. These studies show that, in general, people tend to engage in less intimate sexual behaviours before more intimate behaviours. Within individual sexual occasions, too, non-coital behaviours such as kissing and intimate touching typically precede intercourse (Schwartz, 1999). By extension, then, it is reasonable to assume that first sexual experiences in adolescence proceed in a similar order, with less intimate behaviours occurring first. Only a few studies, however, have used a scaling strategy to answer substantive questions about sexual behaviour (Brook,

Balka, Abernathy, & Hamburg, 1994; Romo, Lefkowitz, Sigman, & Au, 2002; Shtarkshall, Carmel, Jaffe-Hirschfield, & Woloski-Wruble, 2009; Smith & Udry, 1985), and the traditional measurement strategies described earlier continue to dominate.

In this study, sexual behaviours are ordered from least intimate (holding hands) to most intimate (sexual intercourse). Followed over time, this scale of *sexual behaviour intimacy* will reveal variation in individual adolescents' sexual experiences, and patterns of variation may be understood in more detail by including measures of interindividual differences. As Zimmer-Gembeck and Helfand (2008) argued, however, a central goal of longitudinal research on adolescent sex must be to differentiate patterns of sexual behaviour that are maladaptive from patterns that reflect normative experimentation. Indeed, a limitation of current developmental systems-based research is the lack of studies that isolate and compare high- and low-risk people over time (Gottlieb & Halpern, 2002). In the next section, a person-centered analytic strategy is discussed that incorporates the analyses described above and allows for potential sub-group differences in patterns of sexual behaviour intimacy.

Person-centered approach. In a *variable-centered* analytic strategy, adolescents' sexual behaviours are presumed to differ on a person-to-person basis from a single, average pattern that describes all adolescents equally well. To the extent that adolescents' sexual behaviours are heterogeneous, however, the average describes all adolescents equally poorly. At a minimum, the sexual experiences of adolescents who are largely abstinent are likely to be very different

from the sexual experiences of adolescents who engage in sexual intercourse and other more intimate behaviours. Sexually inexperienced adolescents may also have demographic, personal, peer, and family characteristics in common with each other that differentiate them as a group from sexually experienced adolescents. Among sexually experienced adolescents, Zimmer-Gembeck and Helfand (2008) argued that at least two pathways should exist that distinguish typical adolescents experimenting with sex in a normative way from adolescents engaging in risky sex who also exhibit other problems and lack social and familial resources.

Scholars who advocate a developmental systems perspective also encourage a *person-centered* approach in empirical research (Magnusson, 1995; Magnusson & Törestad, 1993; Stattin & Magnusson, 1996). Whereas variable-centered analyses model relations among variables in the same way for all people – reflecting characteristics of and departures from the average only – person-centered analyses allow for relations among variables to carry different weight and meaning for different groups of people (Magnusson & Törestad, 1993). The adolescent antisocial behaviour literature has profited from a person-centered approach by distinguishing the minority of adolescents whose delinquency has long-term developmental consequences from the majority who experiment with delinquent behaviour only in adolescence (Moffitt, 1993; Stattin & Magnusson, 1996).

If it is true that there is substantial heterogeneity in adolescents' sexual behaviours, then adolescent sex research will also profit from person-centered

analyses. Referring to the typical comparisons between virgin and non-virgin adolescents, Miller et al. (1997) argued that making dichotomous measurement distinctions inappropriately treats adolescents who have not yet tried intercourse as a homogeneous group. Adolescents may perceive and experience distinct physical, emotional, and social consequences following different sexual behaviours. Indeed, evidence presented above suggests that adolescents who choose to try certain behaviours and not others differ from their more and less sexually experienced peers (Hensel et al., 2008; Schuster et al., 1996; Woody et al., 2000).

In their study, Miller et al. (1997) devised an ad-hoc classification of 14- to 16-year-old adolescents' coital and non-coital sexual experience. Among adolescents who engaged in sexual intercourse at least once, those who reported having sex with multiple partners initiated intercourse a year earlier than adolescents who had a single, steady partner and adolescents who reported just one occasion of intercourse. Among adolescents who had not yet initiated intercourse, those anticipating intercourse in the next year reported more non-coital behaviours (e.g., kissing, genital touching) than adolescents who did not expect to have sex within the next year. As in the Schuster et al. (1996) and Woody et al. (2000) studies, Miller et al. (1997) showed heterogeneous patterns that would have been obscured by a traditional strategy for analyzing sexual behaviour data.

Recent studies of sexual risk behaviour also capitalized on person-centered analyses. In a sample of adolescents followed from age 15 through 25,

Murphy, Brecht, Herbeck, and Huang (2009) sorted sexual risk behaviours, tracked over time, into high-risk, low-risk, increasing-risk, and decreasing-risk patterns. Low-risk patterns were associated with an older age at first intercourse, higher education, more supportive mothers, and fewer sexually experienced peers at age 16. High-risk patterns were associated with higher alcohol use and higher age 16 delinquency. Moilanen, Crockett, Raffaelli, and Jones (2010) replicated the same four patterns in a sample of adolescents followed from age 16 through 22. Odds of being high-risk were greater for adolescents who exhibited poorer self-regulation, were more susceptible to negative peer pressure, used drugs and alcohol more frequently, and engaged in more delinquent behaviour. To emphasize the usefulness of the person-centered approach, consider another study of sexual risk behaviour that followed late adolescents annually from age 18 through 25 (Fergus, Zimmerman, & Caldwell, 2007). The average pattern of growth in that study showed that sexual risk behaviour increases through late adolescence and declines in young adulthood, closely matching the increasing risk patterns found by Murphy et al. and Moilanen et al. However, only 34% and 29% of people in those studies, respectively, fit the increasing risk pattern. In both studies, almost two thirds were high- or low-risk, patterns best characterized by flat lines. The average pattern described by Fergus et al. may have masked multiple heterogeneous sexual risk trajectories.

Although it is encouraging to see that studies of heterogeneity in adolescent sexual behaviour are emerging, measures of sexual risk behaviour communicate nothing about low-risk sexual behaviour or about experimentation

with behaviours other than intercourse. Indeed, none of the studies discussed above accounted for non-coital sexual experiences in their measures of risk, once again dichotomizing the sexual activities of virgin and non-virgin youth. The few person-centered studies that did incorporate broader measures of adolescents' sexual behaviours provided preliminary evidence that non-coital sexual experience, in addition to intercourse, is relevant in explaining heterogeneity in patterns of adolescent sexual behaviour. One is the first longitudinal study of adolescents' sequence of sexual behaviours: Smith and Udry (1985) showed that over two years, White adolescents' typical pattern was a gradual progression from less intimate ("necking") to more intimate (intercourse) behaviours over time. In a retrospective study of young people aged 12 to 25, de Graaf, Vanwesenbeeck, Meijer, Woertman, and Meeus (2009) found multiple patterns of progression through levels of sexual behaviour intimacy. The majority (73%) reported gradual progression similar to that described by Smith and Udry. On average, young people moved from kissing to intercourse over three years, typically initiating intercourse around age 16 or 17. In contrast to the gradual pattern, 18% of young people reported abrupt movement from initiating the least intimate behaviour (kissing) to initiating the most intimate behaviour (intercourse) within one year or less. The remaining 9% reported nonlinear patterns, in which more intimate behaviours were initiated prior to less intimate ones. Young people who reported abrupt or nonlinear patterns of sexual behaviours initiated sexual intercourse around age 15, and were less educated than the gradual, progressive majority.

In both studies, the authors concluded that gradual, progressive movement from less to more intimate behaviours most likely represented positive or healthy experimentation with sexual behaviours. Smith and Udry (1985) argued that gradual movement from less to more intimate behaviours represented an adjustment or preparatory period in which adolescents had the opportunity to think about and plan for intercourse in the near future. de Graaf et al. (2009) argued that gradual progression was the best match to adolescents' developmental readiness with respect to self-awareness, partner communication skills, and ability to refuse unwanted sexual contact. Adolescents who did not follow a gradual pattern may have lacked some of these skills; perhaps they were persuaded into sexual encounters; perhaps they initiated sexual behaviours to please their partner, impress their friends, or rebel against their parents. Consistent with Smith and Udry's position, de Graaf et al. concluded that abrupt transitions from less to more intimate behaviours lessen adolescents' opportunities to learn from earlier experiences and plan for higher-intimacy behaviours that may be more socially and emotionally stressful.

The heterogeneity evident in the studies of sexual behaviour reviewed here warrants further research attention. In this study, month-to-month patterns of adolescent sexual behaviour are analyzed using a person-centered approach. Bi-monthly patterns of sexual behaviour intimacy over one year are sorted into classes based on similar profiles. The next section contains a review of key demographic, personal, peer, and family predictors that may explain heterogeneity between and within classes identified by this analysis.

Predictors of sexual behaviour patterns. One goal of this study is to reconcile the contrasting emphases of the high-risk and normative perspectives on adolescent sexual behaviour. Indeed, heterogeneity in patterns of adolescent sexual behaviour can likely be explained by incorporating aspects of both perspectives. On the one hand, sexual behaviour can place adolescents at risk for adverse physical, emotional, and social outcomes. Thus, it is important to account for variables that increase the likelihood of experiencing adverse outcomes (i.e., *risk factors*; Jessor, Van Den Bos, Vanderryn, Costa, & Turbin, 1995). On the other hand, sexual behaviour in adolescence may play a preparatory role toward adult sexual competence. Thus, it is also important to account for variables that increase the likelihood that adolescents will thrive as they engage with the stresses of new sexual interests and behaviours (i.e., *protective-enhancing factors*; Luthar, 1993; Luthar, Cicchetti, & Becker, 2000).

This study incorporates proximal measures of risk and protective-enhancing variables at the level of the person (problem behaviour, psychosocial maturity), the peer group (perceptions of friends' sexual experience, friendship intimacy), and the family (parent behavioural control). This study also accounts for demographic variables that predicted variation in other studies of adolescent sexual behaviour.

Demographic. Gender, age, and perceived pubertal timing are demographic variables included in this study. Going through puberty at a younger age is associated with initiating intercourse earlier (Capaldi et al., 1996; Cavanagh, 2004; French & Dishion, 2003; Hipwell et al., 2010). In a meta-

analysis of longitudinal studies of adolescent sexual behaviour, however, Zimmer-Gembeck and Helfand (2008) found that pubertal timing was weakly and inconsistently related to sexual behaviour across studies. The authors noted that failing to control for gender differences may explain discrepant findings. Indeed, they showed that effects of gender are very consistent across studies. In general, boys tend to initiate intercourse earlier than girls. Finally, age must be considered in this study, as adolescents become more sexually experienced with increasing age, and many prior studies emphasized ages at which adolescents initiate intercourse.

Personal. Problem behaviour and psychosocial maturity are person-level risk and protective-enhancing factors, respectively, included in this study. According to problem behaviour theory, adolescents who initiate intercourse too early should also exhibit other behavioural problems. Indeed, delinquency or antisocial behaviour is related to early sexual behaviour (Caminis et al., 2007; Capaldi et al., 1996; Crockett et al., 1996; French & Dishion, 2003) and high-risk sexual behaviour (Boislard et al., 2009; Moilanen et al., 2010; Siebenbruner et al., 2007; Tubman et al., 1996).

Greenberger and colleagues (Greenberger, Josselson, Knerr, & Knerr, 1975; Greenberger & Sørensen, 1974) defined psychosocial maturity as the ability to function independently in society, navigate interpersonal relationships, and contribute to one's community. This study includes measures of key components of the capacity to function independently that follow from Erikson's (1968) theory of psychosocial development, including self-control and self-reliance

(autonomy), internalized values and self-esteem (identity), and standards of competence in work, or work ethic (industry). Galambos, Barker, and Tilton-Weaver (2003) argued that achieving psychosocial maturity sets the stage for a successful transition to adulthood. Some adolescents think that sexual experience will lead to a more mature status (Arbeau, Galambos, & Jansson, 2007; Gowen, Feldman, Diaz, & Yisrael, 2004). In other studies, authors speculated that maturity contributes to adolescents' readiness and ability to negotiate the social and emotional challenges of sexual relationships (e.g., Brady & Halpern-Felsher, 2008; de Graaf et al., 2009). In one study that directly tested the relation between psychosocial maturity and sex, mature first-year university students reported more positive affect and less negative affect during months that they engaged in oral sex or intercourse; the opposite pattern was true for immature students (Dalton & Galambos, 2009).

Peer. Adolescents' perceptions of their friends' sexual experience and adolescents' friendship intimacy are peer-level risk and protective-enhancing factors, respectively, included in this study. A common finding is that adolescents who perceive that their peers are sexually experienced are more likely to engage in sexual behaviours than adolescents who do not perceive that their peers are sexually experienced. This relation holds for perceptions of friends' lower-intimacy behaviours such as hand-holding and kissing (Upadhyay & Hindin, 2006), as well as oral sex (Prinstein et al., 2003) and intercourse (Kinsman et al., 1998; Rosenthal et al., 2001; Upadhyay & Hindin).

Fewer studies have examined relations between adolescent sexual behaviour and the quality, supportiveness, or intimacy of their friendships, and most show relations between friendships and sexual risk behaviour. For example, more secure and supportive friendships are associated with having fewer sexual partners (Benda & Corwyn, 1996; Miller et al., 2002). In a more complex model, Henrich et al. (2006) showed that supportive friendships predicted fewer sexual partners and other risky sexual behaviours only among adolescents who also reported having supportive parents. One study compared ages at first intercourse and showed that adolescents who initiated intercourse in mid-adolescence – between ages 15 and 17 – had higher-quality peer relationships compared to adolescents who initiated intercourse after age 17 (Crockett et al., 1996). Supportive friendships may help adolescents navigate the social and emotional stresses of experimenting with intimate sexual behaviours.

Family. Adolescents' reports of their parents' behavioural control is a family-level variable included in this study. Relations between parent control and adolescent sexual behaviour are complex. In several studies, greater control, monitoring, and supervision of adolescents' activities were associated with initiating intercourse at older ages (Ellis et al., 2003; French & Dishion, 2003; Longmore et al., 2001; Smith, 1997), but overcontrol and harsh discipline were associated with initiating intercourse at younger ages (Ellis et al.; Upchurch et al., 1999). Galambos, Barker, and Almeida (2003) showed that the effectiveness of parent behavioural control is tied to adolescents' peer relations. In their study, higher behavioural control prevented increases over time in problem behaviours

among adolescents who spent time with deviant peers. The opposite was true, however, for adolescents who did not have deviant peers, such that high behavioural control predicted increases over time in problem behaviours. In this study, low and high parent behavioural control may each serve as risk and protective factors that predict month-to-month variation in sexual behaviour intimacy, controlling for demographic, personal, and peer factors.

The Current Study

This study used an intensive repeated measures design to track high school students' sexual behaviours with surveys administered bi-monthly over one year. Such designs permit modeling of developmental *trajectories*, defined as measures of change and stability in the same behaviour over time (Elder & Shanahan, 2006). Trajectories are of interest in developmental research because they enrich our understanding of how individuals change over time (Schulenberg, Maggs, & Hurrelmann, 1997). Although the repeated measures design of this study allows students' responses to be linked across months, sexual behaviour poses important measurement challenges that impact the interpretability of intraindividual trajectories. Specifically, given the dyadic nature of sexual activities, it is possible that behaviours such as kissing, touching, and intercourse take place with different partners across different months, or even within the same month. The varying contexts in which sexual behaviours take place introduce uncertainty about whether students' reports represent the same behavioural construct, month-to-month. It can be difficult to achieve consistent measurement within trajectories

(Elder & Shanahan), and caution is warranted in interpreting the substantive meaning of sexual behaviour trajectories in this study.

Keeping these caveats in mind, students' sexual behaviours in this study will reveal short-term, within-person variations over time and between-persons variation in levels and slopes of sexual behaviour intimacy. By relaxing the assumption that all trajectories derive from a single population, this study will explore heterogeneity in adolescents' sexual behaviours, tracked over time.

Research questions. Three research questions guided this study:

(1) Does heterogeneity in adolescents' trajectories of sexual behaviour intimacy derive from two or more classes (e.g., inexperienced, experienced), represented by distinct intercepts and slopes?

(2) Do interindividual differences in demographic (sex, age, pubertal timing), personal (problem behaviour, psychosocial maturity), peer (friends' sexual behaviour, friendship intimacy), and family (parent behavioural control) variables influence the probability of belonging to a given class?

(3) Do interindividual differences in demographic, personal, peer, and family variables explain within-class heterogeneity in trajectories of sexual behaviour intimacy?

CHAPTER II

Method

Participants

Participants were 106 high school students in Grades 10 (n = 41), 11 (n = 36), and 12 (n = 29) who attended one of seven schools managed by the Edmonton Public district (Eastglen School, Harry Ainlay School, Jasper Place High School, M. E. LaZerte School, McNally School, Strathcona School, and Victoria School of Performing and Visual Arts). Schools represented a range of socio-economic statuses in the City of Edmonton, from lower-income (e.g., Eastglen, Victoria School) to higher-income (e.g., Harry Ainlay, Strathcona) neighbourhoods. Students were initially contacted through visits to Career and Life Management (CALM) classes, mandatory for all students completing diplomas in Alberta schools, and normally completed in Grade 10. The only criterion for exclusion from this study was lack of access to the internet (e.g., at home, school, or public library), as all surveys were administered online. Of the students approached to participate, only one indicated no means of communicating online.

Participants were 57% female (n = 60), aged 15-18 (M = 16.58, SD = .92). The ethnic distribution of the sample was 69.8% White, 10.4% mixed ethnicity, 9.4% Chinese, 4.7% South Asian, 2.8% Aboriginal, 1.9% Korean, and .9% Latin American. Two-thirds lived in two-parent homes (67%), 31% lived in single-parent homes, two students lived with other relatives, and one student lived alone. Fifty-two percent of students had at least one university-educated parent (38% of

mothers and 41% of fathers). Compared to City of Edmonton demographic characteristics (Statistics Canada, 2008), girls in this study were slightly over-represented (57% vs. 49%), visible minorities and Aboriginal youth were represented in similar proportions (30% vs. 28%), single-parent families were over-represented (31% vs. 18%), and students reported a higher proportion of university-educated parents compared to the education level of the general population (38-41% vs. 25%).

Procedure

Recruitment visits to 29 classrooms took place between November, 2008 and February, 2009. A total of 695 students were approached in classes and completed interest forms (see Appendix A) indicating whether they would consider participating in the study. Interested students (n = 457; 66%) provided email addresses and indicated other methods by which they would like to be contacted electronically (e.g., Facebook, Nexopia, MySpace, instant messaging). During classroom visits, students received packages containing detailed information for parents and guardians (Appendix B), a consent form (Appendix C), and a self-addressed, stamped envelope for consent return. To encourage students to take the packages home to their parents, students were offered a movie pass redeemable at Cineplex Odeon cinemas across Canada in exchange for returning a completed parent consent form by mail. Parents and guardians had the option to actively decline consent. Forms were completed and returned by 135 families. Only 12 families refused to grant their children consent to participate. Of

the students who returned consent forms, 106 completed one or more online surveys, for a final participation rate of 15%.

Participants completed bi-monthly surveys beginning in December, 2008, and continuing in each of February, April, June, August, October, and December, 2009. Surveys were hosted by *SurveyMonkey.com*. Participants were notified of each survey by email and by any other requested method of electronic communication as indicated on the interest form. Each message contained a meaningless 5-digit ID number and a personalized, encrypted URL address to access each survey. Secure Socket Layer (SSL) encryption was used to protect the internet connection between each participant and the server on which the data were stored. Each survey was available for approximately one week, with the exception of the final survey in December, 2009. This survey remained open for two weeks due to overlap with the winter break and a concern that some participants might have been on vacation and unable to access the internet. Survey completion rates were as follows: December, 2008: $n = 34$[1]; February, 2009: $n = 88$; April, 2009: $n = 89$; June, 2009: $n = 78$; August, 2009: $n = 83$; October, 2009: $n = 76$; December, 2009: $n = 79$. Beginning in either December, 2008, or February, 2009, 49% of participants completed all seven or all six surveys, and 80% completed four or more surveys. Participants were offered gift cards redeemable at Edmonton-area shopping malls as thank you gifts in exchange for completing surveys. Gift cards were worth $10 for each completed survey. To encourage participation at the end of the study, the final survey in December,

[1] Recruitment was not complete by the time the first survey was released. Participants in this wave represent 32% of the total sample.

2009 was worth $20. The first wave of gift cards were distributed by mail in July, 2009 for completing the December, 2008 and February, April, and June, 2009 surveys. The second wave of gift cards were mailed in January, 2010 for completing the August, October, and December, 2009 surveys. Gift cards were worth $10 to $40 per mailing wave depending on the number of surveys completed.

Measures

Demographic variables. Students' *gender* was coded as female = 0, male = 1. *Age* was a continuous variable calculated by subtracting birthdates from a common date. Students completed one item as a measure of their perceived *pubertal timing*: "Do you think your physical development is (was) any earlier or later than most other boys [girls] your age?" (Dubas, Graber, & Petersen, 1991). Students responded on a five-point scale ranging from 1 (*much earlier*) to 5 (*much later*).

Risk and protective-enhancing factors. Personal, peer, and family risk and protective factors were assessed primarily in February, 2009. Assessments taken in December, 2008 and April, 2009 were used for 5 and 3 students, respectively, who did not complete the February survey.

Personal. Students' *problem behaviour* was measured with the mean of 13 items (Maggs, Almeida, & Galambos, 1995). Students reported the frequency that they engaged in delinquent activities over the past year (e.g., "took things worth between $2 and $50"; "became angry and broke things") on a scale ranging from 1 (*never*) to 5 (*almost every day*). Coefficient alpha was .86. Maggs et al.

evaluated the construct validity of this scale and found relations between problem behaviour and measures of adolescents' self-image, peer relations, and perceptions of the fun and risk involved in misconduct. Coefficient alpha in their sample of adolescents tracked from age 11 through 15 was .84.

Three subscales from the Erikson Psychosocial Inventory Scales (EPSI; Rosenthal, Gurney, & Moore, 1981) were combined to form a measure of students' *psychosocial maturity*. Students rated how much they felt each item was true for them, on a scale ranging from 1 (*hardly ever true*) to 5 (*almost always true*). The autonomy subscale included 12 items such as "I like to make my own choices" and "I find it hard to make up my mind" (reverse-scored). The identity subscale included 12 items such as "I know what kind of person I am" and "I change my opinion of myself a lot" (reverse-scored). The industry subscale included 12 items such as "I'm a hard worker" and "I stick with things until they're finished". The mean of all 36 items was taken, with higher scores indicating greater psychosocial maturity. Coefficient alpha for the combined scale was .92. Rosenthal et al. showed adequate reliability statistics (range of α = .62 - .75), and that subscales were correlated with related scales of psychosocial maturity developed by Greenberger and Sørensen (1974).

Peer. Students' perceptions of their *friends' sexual experience* was measured with one item: "How many of your friends do you think have had penetrative sex?" rated on a scale ranging from 1 (*none*) to 4 (*most*). Penetrative sex was defined as "sexual intercourse (penis in vagina)", in relation to a previous question about students' sexual behaviour. Students rated their *friendship*

intimacy with 12 items from the Network of Relationships Inventory (Buhrmester, 1990; Furman & Buhrmester, 1985). Items assessed students' perceived levels of companionship, disclosure, support, and relationship satisfaction with their two closest friends (students were asked not to rate romantic partners). Items for each friend (e.g., "how often do you turn to this person for support with personal problems?"; "how happy are you with your relationship with this person?") were rated on a scale ranging from 1 (*never or hardly at all*) to 5 (*always or extremely much*). The mean of all 24 items across both friends was taken. For the 5 students who rated only one friend, scores were the mean of 12 items. Higher scores indicate greater friendship intimacy. Coefficient alpha was .91. Furman and Buhrmester evaluated the validity of their original 30 items by showing that children's ratings of relationships with parents, grandparents, teachers, friends, and siblings were consistent with theoretical expectations. Mean coefficient alpha across subscales was .80.

Family. Students' perceptions of their parents' *behavioural control* was measured with a subscale of the Children's Reports of Parental Behavior Inventory (Burger & Armentrout, 1971; Schaefer, 1965). Sixteen items for each parent (e.g., "he/she usually doesn't find out about my misbehaviour"; "he/she doesn't insist that I do my homework") were rated on a five-point scale ranging from 1 (*very much unlike him/her*) to 5 (*very much like him/her*). Coefficient alpha was .89 for the father items and .94 for the mother items. To evaluate their validity, Schaefer used the items to test for differences between delinquent and non-delinquent boys, and correlated children's self-reports with mothers' and

fathers' reports. All items showed evidence of good validity and internal consistency.

Following Schwarz, Barton-Henry, and Pruzinsky (1985) and Galambos, Barker, and Almeida (2003), the mean of the mother and father items was calculated. Schwarz et al. showed that aggregating scores across reporters improved the reliability of the measure by reducing systematic error variance. Coefficient alpha for the combined scale was .94. Mother and father subscales differed by one point or less for 84% of students' ratings. The mean difference between mother and father subscales was .09 (*SD* = .77). There were five cases for which only mother ratings were used and four cases for which only father ratings were used because the student either refused to answer questions about the other parent or did not have a second parent. Mean parent behavioural control was 3.40 (*SD* = .63), with higher scores indicating stricter control.

Sexual behaviour. Students answered questions about seven sexual behaviours each month, preceded by the following statement: "On the next pages you will see behaviours that can be described as sexual. These behaviours can occur between people who are exploring sexual feelings, and between people who are sexually attracted to each other. Please tell us how often you have engaged in any of these behaviours in the past two months." Items were adapted from a list of behaviours used in a large, nationally representative sample of Canadian students in Grades 7, 9, and 11 (Boyce, Doherty, Fortin, & Mackinnon, 2003). Ordered from least to most intimate, sexual behaviours that followed this statement were: (1) "holding hands", (2) "kissing (closed mouth)", (3) "deep kissing (open

mouth)", (4) "touching or fondling above the waist", (5) "touching or fondling below the waist", (6) "oral sex (mouth contact with private parts)", and (7) "sexual intercourse (penis in vagina)". Students responded on a scale ranging from 1 (*never*) to 5 (*almost every day*). Table 1 shows the means and standard deviations of students' bi-monthly responses to each sexual behaviour. Table 2 shows percentages of students who reported participating in each sexual behaviour, averaged across months. Table 2 also shows the proportions of students who reported that they engaged in each behaviour with a person who was a romantic relationship partner, with a person who was not a romantic relationship partner, and with both romantic and non-romantic partners. Students' mean numbers of partners also appear in Table 2.

Students' responses to each sexual behaviour were dichotomized, distinguishing students who did not engage in a given behaviour during the past two months (0) from students who did (1). Responses to all behaviours were combined to create an 8-point scale of *sexual behaviour intimacy* ranging from 0 (*no sexual behaviour*) to 7 (*sexual intercourse*), where students' scores corresponded to the most intimate behaviour they reported each month.

To assess the validity of this scaling strategy, coefficients of scalability and reproducibility were calculated to determine the extent to which the ordered sexual behaviours formed a Guttman scale. Across months, coefficients of scalability ranged from .92 to .97, and coefficients of reproducibility ranged from .97 to .99, exceeding recommended minima of .80 and .90, respectively. Across months, 82% to 92% of participants' responses formed perfect Guttman scales.

Table 1

Means and Standard Deviations of Bi-Monthly Frequency Reports of Seven Sexual Behaviours

	Dec '08		Feb '09		Apr '09		Jun '09		Aug '09		Oct '09		Dec '09	
	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	SD
Holding hands	2.44	*1.35*	2.67	*1.61*	2.22	*1.50*	2.14	*1.48*	2.32	*1.56*	2.34	*1.49*	2.47	*1.57*
Kissing	2.06	*1.43*	2.26	*1.55*	2.06	*1.48*	2.01	*1.45*	2.31	*1.55*	2.05	*1.48*	2.34	*1.62*
Deep kissing	1.76	*1.21*	1.99	*1.43*	1.90	*1.36*	1.85	*1.31*	2.15	*1.45*	1.93	*1.43*	2.23	*1.55*
Touching above the waist	1.68	*1.01*	1.98	*1.36*	1.87	*1.26*	1.81	*1.16*	1.97	*1.34*	1.78	*1.25*	2.00	*1.32*
Touching below the waist	1.44	*.86*	1.74	*1.22*	1.66	*1.11*	1.58	*1.02*	1.86	*1.27*	1.69	*1.25*	1.88	*1.27*
Oral sex	1.12	*.33*	1.36	*.89*	1.27	*.60*	1.28	*.78*	1.49	*.98*	1.38	*.89*	1.63	*1.12*
Sexual intercourse	1.27	*.80*	1.52	*1.04*	1.41	*.89*	1.21	*.66*	1.59	*1.12*	1.47	*1.05*	1.62	*1.13*
N	33-34		86-87		85-88		74-77		79-82		73-74		70-74	

Note. Sexual behaviour frequencies are reported on a scale ranging from 1 (*never*) to 5 (*almost every day*).

Table 2

Rates of Participation Across the Span of the Study and Types of Partners for Seven Sexual Behaviours

	Holding Hands	Kissing	Deep Kissing	Touching Above	Touching Below	Oral Sex	Intercourse	N
Participated in behaviour at least once[a]	81	64	56	61	53	35	36	104-105
with a relationship partner[a,b]	68	79	85	81	80	81	79	36-84
with a non-relationship partner[a,b]	77	61	56	60	58	44	42	36-84
with relationship and non-relationship partner[a,b]	51	42	42	43	40	28	22	36-84
Mean number of partners (*SD*) across all months[c]	3.80 (*3.67*)	3.13 (*3.07*)	2.86 (*2.72*)	2.42 (*2.06*)	2.28 (*1.97*)	2.24 (*2.10*)	2.26 (*2.22*)	21-46

[a]Rates reported as percentages. [b]Percent of students who participated in the given sexual behaviour with a relationship and/or non-relationship partner. [c]Partner means and standard deviations for students who reported one or more partners.

Analysis Plan

Taking a person-centered, developmental systems approach, this study features data analyses that model individual differences in trajectories of sexual behaviour intimacy over time. Rather than focusing exclusively on individual departures from the average, however, heterogeneous trajectories of sexual behaviour intimacy were sorted into more homogeneous latent classes. Relations between sexual behaviour trajectories and demographic, personal, peer, and family variables were permitted to vary across classes, to account for the possibility that risk and protective-enhancing factors carried different weight and meaning for trajectories of sexual behaviour intimacy in different groups of adolescents. Note, however, that the interpretability of sexual behaviour trajectories is likely compromised by multiple partner contexts in which sexual behaviours took place across months. Students in the final wave reported the number of partners with whom they tried each sexual behaviour. The proportion of students who had just one partner across all months ranged from 34% (holding hands) to 53% (sexual intercourse). Although a consistent measurement context may be assumed for these students, sexual behaviour contexts of other students varied from partner to partner. Therefore, it is crucial that trajectories of sexual behaviour are interpreted with this limitation in mind.

A key assumption of this study is that heterogeneity in patterns of sexual behaviour can be explained by grouping together adolescents who report similar behaviours in similar patterns. Following this assumption, data for this study were analyzed using the technique of *growth mixture modeling* in M*plus* version 5.21

(Muthén & Muthén, 2009). In a conventional linear latent growth curve model, individuals are assumed to belong to a single population with a single set of parameters representing the group mean (intercept) and rate of change (slope). Growth mixture modeling allows for the possibility that individuals may belong to one of two or more sub-populations, each with its own intercept and slope (Muthén, 2004). Growth mixture modeling can be used to analyze trajectories that are hypothesized to represent two or more classes of people, where class membership is not known *a priori*.

Hypothesized subpopulations are estimated in growth mixture models as latent classes. One strategy for estimating latent classes is to assume that individuals within a given class are a homogeneous group, and to assess only differences in the probability of belonging to a given class. An advantage of this method of *group-based trajectory modeling* (Nagin, 1999) is that models are less computationally demanding and more easily produce statistically stable solutions. In this study, however, the assumption of no within-class heterogeneity is untenable. Previous research has linked adolescent sex to demographic, biological, behavioural, family, peer, school, and community variables. It is unlikely, therefore, that a modest number of latent classes can effectively represent these interindividual differences as homogeneous profiles.

Growth mixture models permit between- and within-class heterogeneity. However, several cautions should be noted that may affect the interpretability and generalizability of growth mixture model results obtained in this study. First, given the added computational complexity of permitting and estimating within-

class variation, model convergence is more difficult to achieve, and stable, replicable parameter estimates are less likely. Second, variables used to predict within-class heterogeneity should ideally be chosen based on strong theory and a history of consistent and reliable associations with the outcome variable (Little, Card, Preacher, & McConnell, 2009; Muthén, 2004). In the absence of such reliability, researchers run the risk of discovering spurious associations. The adolescent sexual behaviour literature, however, contains a surplus of evidence for potential predictors and a dearth of evidence for consistent, reliable, and essential predictors. In the absence of a consensus over key covariates of adolescent sexual behaviour, proximal variables at the personal, peer, and family levels were selected over more distal predictors at the school and community levels. These concerns warrant caution in the interpretation of growth mixture model results in this study.

Trajectories of sexual behaviour in this study should be represented by at least two classes of adolescents (Moffitt, 1993; Zimmer-Gembeck & Helfand, 2008), separating patterns of behaviour that reflect normative experimentation from patterns that suggest higher risk. Person-centered studies (e.g., Miller et al., 1997) suggest that sexually inexperienced adolescents may be distinguished from sexually experienced adolescents in a third class. Although adolescents' sexual behaviour patterns may be further distinguished by classes that represent increasing and decreasing risk trajectories (Moilanen et al., 2010; Murphy et al., 2009), only two- and three-class growth mixture models were considered in this study, in addition to a one-class comparison model. Four- and five-class models

were considered during initial stages of data analysis, but abandoned because the number of parameters to be estimated was greater than the sample size.

CHAPTER III

Results

Final Sample

The final model in this study includes data from a subsample of 88 students who completed at least one bi-monthly measure of sexual behaviour and had complete data for all demographic, personal, peer, and family variables in the analysis. Demographic characteristics of the subsample closely matched the demographics of the full sample. Students in the subsample were 57% female (n = 50), aged 15-18 (M = 16.59, SD = .95). The ethnic distribution of the subsample was 73% White, 8% mixed ethnicity, 8% Chinese, 6% South Asian, 2% Aboriginal, 2% Korean, and 1% Latin American. Two-thirds lived in two-parent homes (67%), 31% lived in single-parent homes, one student lived with other relatives, and one student lived alone. Fifty-one percent of students had at least one university-educated parent (35% of mothers and 40% of fathers). A series of t- and χ^2-tests compared the demographics of the subsample to the 18 students excluded due to missing data. No significant differences emerged.

Another series of t- and χ^2-tests assessed the impact of attrition on the full sample. Students who provided complete data (n = 47) were compared to students who failed to complete one or more waves of assessment (n = 41; M waves completed = 3.51; SD = 1.55). There were no significant differences in the demographic characteristics of students with complete versus incomplete data. There were also no significant differences in students' responses to demographic, personal, peer, and family variables. Sexual behaviour intimacy scores differed

only in August. Students with incomplete data reported more intimate sexual behaviours compared to students with complete data (M = 4.39, *SD* = 3.03 vs. M = 2.15, *SD* = 2.8, Bonferroni t (68) = 3.06, $p < .05$, partial η^2=.12).

Finally, t- and χ^2-tests were used to compare students who participated in the study beyond the first three waves (n = 77) with students who dropped out completely after the December '08, February, or April waves (n = 11). No significant differences emerged. Taken together, these findings suggest that the sample is not strongly biased by attrition.

Descriptive Statistics

Demographic, personal, peer, and family variables. Table 3 shows means, standard deviations, and intercorrelations of demographic (sex, age, pubertal timing), personal (psychological maturity, problem behaviour), peer (friends' sex, friendship intimacy), and family (parent behavioural control) variables used in the final model. Average perceived pubertal timing was below the midpoint of the measure, indicating that most students felt they developed slightly earlier or at about the same time as their same-sex peers. Mean psychosocial maturity scores were above the midpoint of the measure, indicating that most students reported relatively high levels of autonomy, identity, and industry. Mean problem behaviour scores were very low, indicating that most students did not engage in any problem behaviour during the past year, or not more than once or twice. Mean scores for perceptions of friends' sexual behaviour were close to the midpoint of the measure, indicating that most students thought that at least some of their friends had engaged in sexual intercourse. Mean

Table 3

Means, Standard Deviations, and Intercorrelations of Demographic, Personal, Peer, and Family Variables

	1	2	3	4	5	6	7	*M* (*SD*)
1. Gender[a]	--							43
2. Age	.06	--						16.59 (.95)
3. Pubertal timing	.05	.04	--					2.74 (.85)
4. Psychosocial maturity	-.05	.13	-.04	--				3.64 (.54)
5. Problem behaviour	.10	.25*	-.15	-.20	--			1.27 (.40)
6. Friends' sex	-.05	.33*	-.05	-.18	.32*	--		2.16 (.93)
7. Friendship intimacy	-.31*	-.03	-.00	.04	-.12	.19	--	3.46 (.63)
8. Parent behavioural control	-.12	-.06	.19	.11	-.34*	-.05	-.04	3.39 (.64)

[a]percent male.

*$p < .05$

friendship intimacy scores were above the midpoint of the measure, indicating that most students had access to one or more friends as sources of intimate companionship and support. Mean parent behavioural control ratings were above the midpoint of the measure, indicating that most students felt that their mothers and fathers exercised some control over their activities and behaviours.

Few of the correlations among predictor variables shown in Table 3 were significant. Girls had more intimate friendships than did boys. Older students reported more problem behaviours and perceived more of their friends to be sexually experienced than did younger students. Students who reported more problem behaviours perceived that more of their friends were sexually experienced and that their parents exercised less behavioural control compared to students who reported fewer problem behaviours. Pubertal timing and psychosocial maturity were not correlated with any other variables.

Sexual behaviour intimacy. Table 4 shows the means, standard deviations, and skewness of each bi-monthly measure of sexual behaviour intimacy. Means ranged from 2.33 to 3.13, indicating that many students only engaged in lower-intimacy sexual behaviours (kissing, deep kissing, touching above the waist) throughout the year. However, the large standard deviations indicate that some students reported no sexual behaviours, and others reported more intimate behaviours such as oral sex and intercourse across months. Table 4 also shows the proportions of students who reported engaging in each of seven sexual behaviours across months. Greater proportions of students reported less

Table 4

Means, Standard Deviations, and Skewness of Bi-Monthly Sexual Behaviour Intimacy and Bi-Monthly Percentages of Students Reporting Each Sexual Behaviour

	Dec 08	Feb 09	Apr 09	Jun 09	Aug 09	Oct 09	Dec09
Summary statistics							
Mean[a]	2.47	2.91	2.73	2.33	2.89	2.64	3.13
Standard deviation	2.44	2.84	3.00	2.62	3.05	2.91	3.04
Skewness[b]	1.34	1.49	1.46	1.94	1.24	1.75	.71
n	32	85	73	64	70	61	61
Individual behaviours							
Holding hands	69	65	49	50	53	57	61
Kissing	41	49	42	41	49	42	49
Deep kissing	34	39	39	37	44	38	49
Touching above the waist	39	43	42	40	43	39	47
Touching below the waist	25	32	34	29	38	29	41
Oral sex	10	18	21	13	25	20	28
Sexual intercourse	10	24	24	11	28	23	29
n	31-32	84-85	71-73	61-64	67-70	60-61	57-61

[a]sexual behaviour intimacy scores range from 0 (*no sexual behaviour*) to 7 (*sexual intercourse*).

[b]skewness values are ratios of skewness to standard error of skewness. Obtained values between -2 and 2 indicate normally distributed variables.

intimate compared to more intimate behaviours, but genital-stimulating behaviours (touching below the waist, oral sex, intercourse) were reported by 10% to 41% of students across months.

Missing Data

Table 5 shows 26 unique patterns and frequencies of cases with complete and missing data across the seven bi-monthly waves of measurement. Forty-seven students (53%) completed all surveys, beginning in either December, 2008 (n = 20) or February, 2009 (n = 27). Including 22 other students who completed four to six waves, 78% of the final sample completed surveys at more than half of the waves of measurement. Six students (7%) completed only one wave.

A limitation of missing data in this study is that it reduces statistical power to detect significant effects. Even with seven waves of data, the smaller sample size and complex analysis imply that significant differences are likely to have small effect sizes. Estimates of power to detect differences in slopes in a three-class model were obtained with a Monte Carlo simulation in M*plus*. Given 88 cases, no missing data, and no covariates of sexual behaviour intimacy, power to detect unique intercepts across classes was 1.0, but power to detect unique slopes ranged from .40 to .60. With missing data and covariates in the final analysis, power is low and effects detected in this study may not replicate in future studies with other samples. Therefore, it is important to retain as many cases and data points as possible.

Full information maximum likelihood estimation was used to calculate class-specific intercepts and slopes of sexual behaviour intimacy, permitting all

Table 5

Missing Data Patterns and Frequencies

	Missing Data Patterns																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Dec ‘08	x		x			x					x			x		x		x			x		x			x
Feb ‘09	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x
Apr ‘09	x	x			x	x		x	x	x	x	x	x	x				x	x	x		x		x	x	x
Jun ‘09	x	x				x		x				x			x		x	x	x		x		x	x	x	x
Aug ‘09	x	x			x	x	x	x		x	x		x	x			x	x	x			x			x	x
Oct ‘09	x	x					x				x		x				x	x	x		x	x		x		x
Dec ‘09	x	x			x		x		x		x		x				x	x			x			x	x	
Frequency	20	27	3	4	2	1	2	4	1	2	1	2	3	1	1	2	1	1	2	2	1	1	1	1	1	1

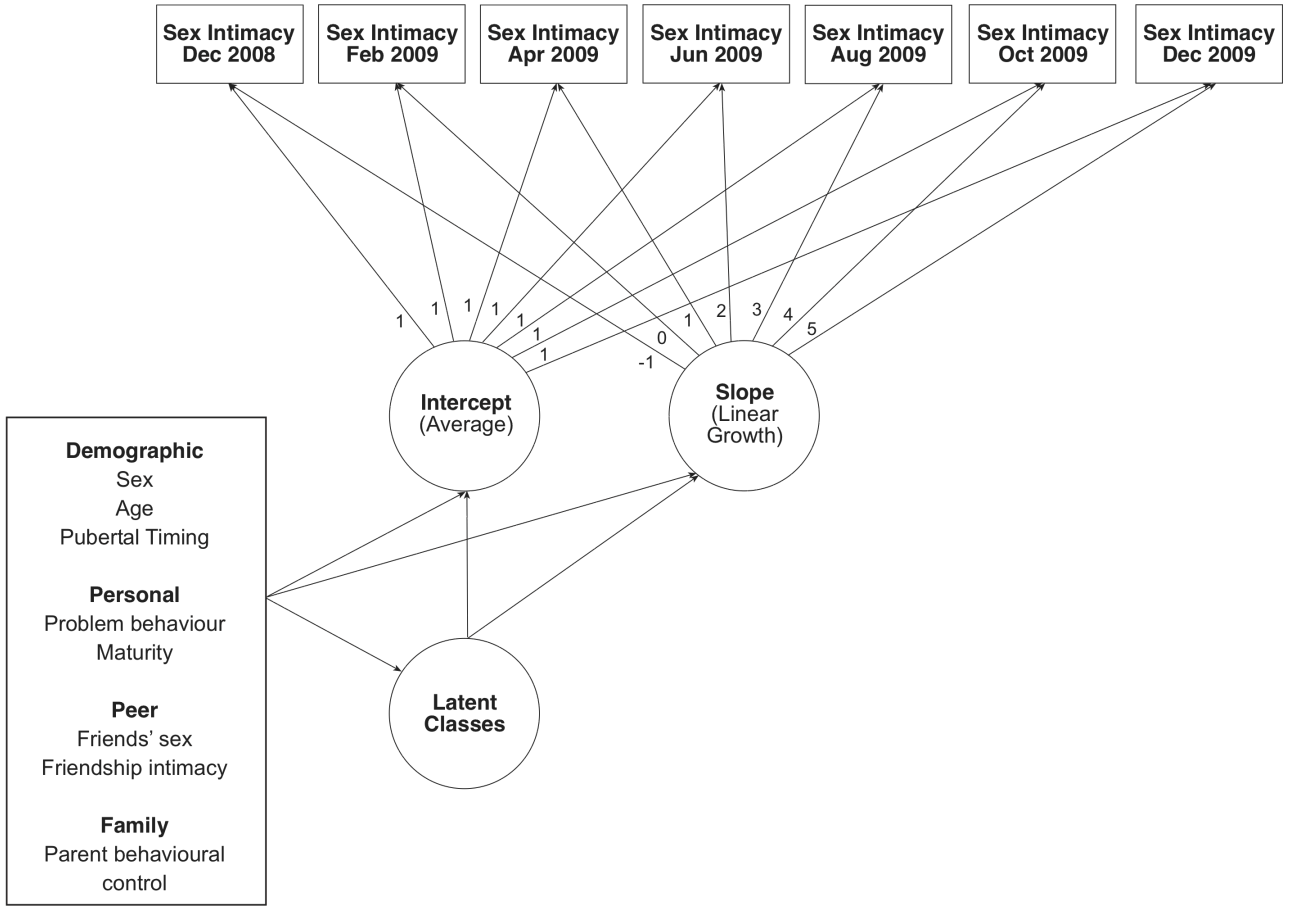
Note. Cases present at each wave are denoted by an x.

cases with at least one wave of measurement to be included in the analysis. In large samples, maximum likelihood estimates are consistent, asymptotically efficient, and asymptotically normal, producing more accurate estimates of standard errors than procedures such as listwise deletion and single imputation (Allison, 2002). The accuracy of parameter estimates and standard errors based on maximum likelihood, however, rest on the assumption that data are at least *missing at random* (MAR). Under MAR, patterns of missingness can be correlated with variables included in the analysis, but not with variables excluded from the analysis (Little et al., 2009). Given that few differences emerged between students who supplied complete versus incomplete data, the MAR assumption is reasonable in this study.

Growth Mixture Modeling

The growth mixture model used in this study is an extension of conventional linear latent growth curve modeling. Figure 1 shows a measurement model in which seven bi-monthly measures of sexual behaviour intimacy are regressed on the latent intercept and slope. The intercept was specified by assigning a factor loading of 1 to the regression of each bi-monthly variable on the latent variable representing the intercept. The linear slope is specified by assigning factor loadings that represent equal intervals of time between bi-monthly measures. For this analysis, factor loadings were -1 (December 2008), 0 (February 2009), 1 (April 2009), 2 (June 2009), 3 (August 2009), 4 (October 2009) and 5 (December 2009).

Figure 1. Measurement Model of the Effects of Demographic, Personal, Peer, and Family Variables on Initial Levels and Trajectories of Sexual Behaviour Intimacy Across Latent Classes.



To permit estimation of different parameters across classes, the intercept and slope growth factors were regressed on a latent variable representing class membership. The analysis estimated unique intercept and slope values for each class according to the number of classes specified. In addition, the latent variables representing the intercept, slope, and class membership were each regressed on demographic, personal, peer, and family variables measured in February. These regressions show whether risk and protective-enhancing factors influenced the probability that a given individual belonged to a given class (the regression of class membership on predictor variables). They also show whether any variables predicted additional within-class heterogeneity not explained by class membership (the regression of intercept and slope on risk and protective-enhancing factors).

Traditional model-building strategies, in which a basic growth model is estimated and predictors are added at a later step, are not recommended for growth mixture models (Muthén, 2004). In this model, if the demographic, personal, peer, and family variables are related to class membership and to the intercepts and slopes, then class membership assignments in a model that excludes these variables are distorted. Similarly, estimates of the relative probability of belonging to one class or another are distorted if predictors of class membership are excluded. Therefore, only models that include all predictors are discussed in this study.

The M*plus* commands used to generate one-, two-, and three-class growth mixture models tested in this study are given in Appendix D. Constraints were

placed on these models to facilitate convergence. Residual variances of the intercepts and slopes within each class were fixed at 0, and were not permitted to covary with each other or with the demographic, personal, peer, and family predictors. Residual variances of each of the bi-monthly measures of sexual behaviour intimacy were constrained to be equal.

One important concern with growth mixture models is that they often converge at local maxima (Bollen & Curran, 2006; Muthén & Muthén, 2007). The likelihood function of a given model will have its peak at the point at which the parameters estimated for the specified model provide optimal (most likely) fit to the data, that is, the *global* solution. The likelihood functions of growth mixture models are often multi-modal, however, leading to the possibility that the model will converge at a *local* solution, that is, a peak in the distribution that provides more likely parameter estimates than nearby points, but less likely estimates than those provided by the global solution. To address this problem, the model tested in this study was estimated using 10,000 randomly generated starting values to map out the likelihood space more effectively and ensure that the best likelihood value was replicated.

Table 6 shows the values of statistics used to compare the relative fit of one-, two-, and three-class models. The difference between Bayesian Information Criterion (BIC) values for competing models can be used to compute the probability that the model with the smaller BIC value is correct. BIC differences of 12 or greater provide very strong evidence in favour of one model over another (Wagenmakers, 2007). From Table 5, the fits of the 2- and 3-class models are

Table 6

Fit Statistics Generated by One-, Two-, and Three-Class Growth Mixture Models

	Number of Latent Classes		
	1	2	3
BIC	2093.78	1922.83	1922.87
LMR-LRT	-	289.44*	120.43*

Note. BIC = Bayesian Information Criterion. LMR-LRT = Lo-Mendell-Rubin Likelihood Ratio Test. LMR-LRT is not computed for a one-class model because it is a test of fit relative to a model with one less class.

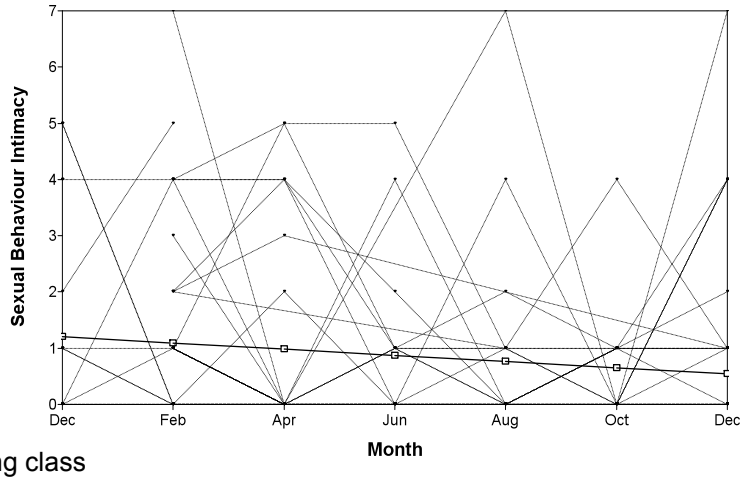
*$p < .01$

better than a 1-class model. The small BIC difference of .04 between the 2- and 3-class models indicates that both fit the data equally well. A second measure of fit is used to choose between the 2- and 3-class models. The Lo-Mendell-Rubin Likelihood Ratio Test (LMR-LRT; Lo, Mendell, & Rubin, 2001) compares the fit of a given model to a model with one less class. Here, the fit of a 3-class model was compared to the fit of a 2-class model, and the fit of a 2-class model was compared to the fit of a 1-class model. In both cases, the significant LMR-LRT values suggest that the more complex model provided better fit to the data. Based on the comparable BIC values of the 2- and 3-class solutions and a significant LMR-LRT, the 3-class model was retained as the final model in this analysis.

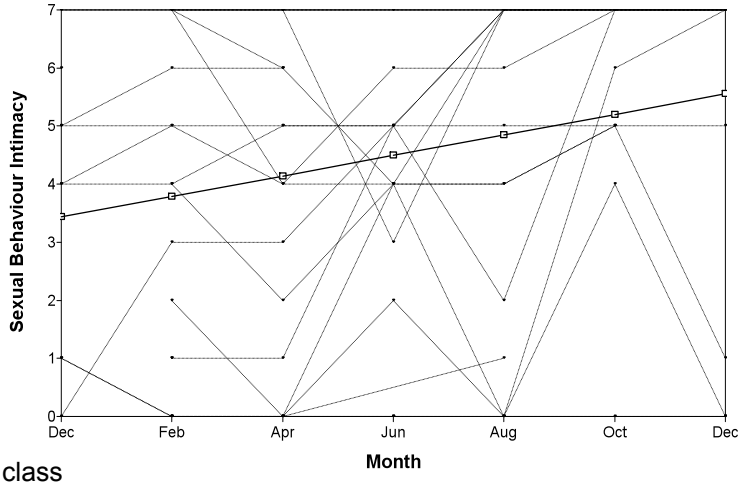
Appendix E shows selected M*plus* output corresponding to the final model, which provided good distinction among the three classes. Classification quality is indicated by a high entropy value of .95, and probability estimates were .98, .98, and .99 that participants were correctly assigned to classes 1, 2, and 3, respectively. Figure 2 shows average trajectories of sexual behaviour intimacy across months (not controlling for demographic, personal peer, and family covariates) overlaid on class members' individual trajectories. The first class (Figure 2, Panel A; $n = 41$) contains adolescents who engaged in less intimate sexual behaviours on average, and whose behaviours became marginally less intimate over time. Most adolescents in this class restricted their sexual behaviours to non-genital activities (i.e., hand-holding through touching above the waist). Hence, this class is labeled *inexperienced*. The second class (Figure 2, Panel B; $n = 21$) contains adolescents who engaged in sexual behaviours of

Figure 2. Individual and Average Trajectories of Sexual Behaviour Intimacy Across Classes.

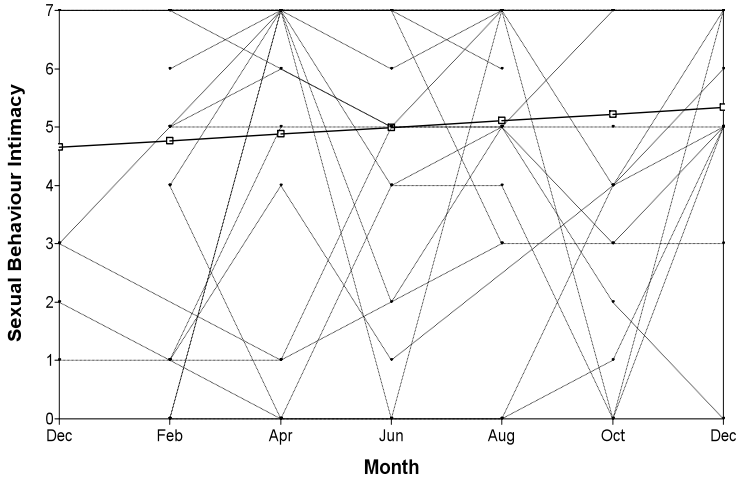
A. Inexperienced class



B. Experimenting class



C. Experienced class



varying levels of intimacy on average, and engaged in significantly more intimate behaviours over time. Most adolescents in this class reported genital-stimulating behaviours at some point across months (i.e., touching below the waist, oral sex, and intercourse), but visual inspection of the individual trajectories suggests that progression from less to more intimate behaviours is gradual, and does not always lead to intercourse. Hence, this class is labeled *experimenting*. The third class (Figure 2, Panel C; $n = 26$) contains adolescents who engaged in more intimate sexual behaviours on average, with similar levels of intimacy over time. Across months, adolescents in this class reported touching above the waist through intercourse more frequently than less intimate behaviours. Visual inspection of the individual trajectories suggests that month-to-month transitions from less to more intimate behaviours were more abrupt compared to the experimenting class. Hence, this class is labeled *experienced*.

Table 7 shows the class-specific proportions of students who ever engaged in each of seven sexual behaviours by the beginning of the study. For each behaviour, inexperienced students' rates were lower than those of experienced students. Inexperienced students' rates were lower than those of experimenting students for each behaviour except holding hands. Rates reported by experimenting students were not significantly different from rates reported by experienced students for any behaviour. Students' prior sexual behaviours also closely matched the sexual behaviours they reported during study months. Of those who reported lifetime prior sexual experiences, most repeated behaviours during study months in which they had engaged before the study [96% ($n = 67$)

Table 7

Percentages of Students in the Inexperienced, Experimenting, and Experienced Classes Reporting Prior Experience with Seven Sexual Behaviours

	Class			
	Inexperienced	Experimenting	Experienced	*F*
Prior sexual experience (%)				
Holding hands	68	81	96	4.03*
Kissing	46	76	92	9.63*
Deep kissing	32	71	92	17.73*
Touching above the waist	34	76	85	12.58*
Touching below the waist	20	67	73	14.27*
Oral sex	7	38	46	8.37*
Intercourse	2	50	50	16.51*

repeated holding hands; 90% (n = 53) repeated kissing; 88% (n = 46) repeated deep kissing; 90% (n = 47) repeated touching above the waist; 83% (n = 34) repeated touching below the waist; 74% (n = 17) repeated oral sex; 92% (n = 22) repeated sexual intercourse].

Similar proportions of students in all classes lived in two-parent homes and had university-educated parents. Asian students (Chinese, Korean, and South Asian) were similarly represented in all classes, but students belonging to other ethnic minorities were primarily classified as experimenting or experienced ($\chi^2(2) = 6.07$; $p < .05$). Similar proportions of students in all classes said that they did not have exclusively heterosexual attractions (i.e., sexual minority). Nineteen percent of the sample was sexual minority adolescents, including 8 students in the inexperienced class (20%), 4 students in the experimenting class (19%) and 5 students in the experienced class (19%).

External validity of the three-class solution. Model fit statistics support the selection of the three-class model used this study. However, it is also useful to evaluate the external validity of the model by comparing classes on variables relevant to understanding adolescent sex that were not included in the final model (Aldenderfer & Blashfield, 1984). Class comparisons of students' ages at first intercourse, number of sexual partners, condom use, romantic relationships, and alcohol use were used as measures of external validity.

Table 8 shows the class-specific means and standard deviations for all external measures. Only one student in the inexperienced class reported ever engaging in sexual intercourse. Therefore, comparisons of age at first intercourse,

Table 8

Class-Specific Means (Standard Deviations) of External Validity Measures

	Class		
	Inexperienced	Experimenting	Experienced
Age at first intercourse	17.58[a]	16.19 (1.22)	16.01 (.99)
Number of sexual partners	2.5[a]	2.08 (.41)	2.34 (.70)
Condom use	3.33[a]	3.63 (1.35)	2.80 (1.83)
Romantic relationship[b]	14	55	59
Alcohol use	1.58 (.91)	2.09 (1.14)	3.14* (1.37)

Note. Condom use reported on a scale ranging from 1 (*never*) to 5 (*every time*). Occasions of alcohol use in the past two months are reported on the following scale: 1 = 0, 2 = 1-2, 3 = 3-5, 4 = 6-9, 5 = 10-19, 6 = 20-39, 7 = 40+.

[a]values are for the single participant in the inexperienced class who reported sexual intercourse experience.

[b]percentage of months in which participants reported being in a romantic relationship.

*$p < .05$

number of sexual partners, and condom use can only be made between the experienced and experimenting classes. However, no significant differences emerged. Across months, students classified as experienced reported the most alcohol use [$F(2) = 15.54, p < .05$]. Experienced students reported more occasions than inexperienced students (Tukey HSD = 1.55, $p < .05$) and experimenting students (Tukey HSD = 1.05, $p < .05$). Students classified as experimenting or experienced reported that they were involved in romantic relationships more than half of the time, whereas students classified as inexperienced only reported being involved in romantic relationships 14% of the time (about once across the seven bi-monthly surveys).

Descriptive statistics by class membership. Table 9 shows class-specific means and standard deviations for demographic, personal, peer, and family predictor variables and bi-monthly sexual behaviour intimacy scores. Based on visual inspection of the means, adolescents classified as *inexperienced* appeared to be younger, reported average pubertal timing, average psychosocial maturity, average problem behaviours, perceived fewer of their friends to be sexually experienced, reported less intimate friendships, and less parent behavioural control. Adolescents classified as *experimenting* appeared to be older, reported earlier pubertal timing, higher psychosocial maturity, fewer problem behaviours, perceived more of their friends to be sexually experienced, reported more intimate friendships, and less parent behavioural control. Adolescents classified as *experienced* appeared to be older, reported later pubertal timing, lower psychosocial maturity, more problem behaviours, perceived more of their friends

Table 9

Means (Standard Deviations) of Demographic, Personal, Peer, and Family Variables and Bi-Monthly Sexual Behaviour Intimacy by Class Membership

	Class		
	Inexperienced	Experimenting	Experienced
Sex (% Male)	37	38	58
Age	16.17 (.82)	16.97 (.97)	16.95 (.87)
Perceived pubertal timing	2.68 (.72)	2.48 (.81)	3.04 (1.00)
Problem behaviour	1.28 (.54)	1.15 (.16)	1.35 (.26)
Psychosocial maturity	3.60 (.56)	3.87 (.44)	3.53 (.55)
Perceived friends' sex	1.73 (.81)	2.48 (.87)	2.58 (.90)
Friendship intimacy	3.31 (.62)	3.56 (.66)	3.60 (.59)
Parent behavioural control	3.26 (.64)	3.86 (.52)	3.22 (.54)
Sexual behaviour intimacy			
December 2008	1.35 (1.90)	4.00 (2.54)	3.20 (2.28)
February 2009	1.25 (1.77)	4.00 (2.87)	4.68 (2.80)
April 2009	.77 (1.63)	3.76 (2.77)	5.14 (2.83)
June 2009	.48 (1.15)	4.07 (2.12)	4.50 (2.50)
August 2009	.55 (1.42)	4.44 (2.90)	5.38 (2.25)
October 2009	.39 (.80)	5.79 (1.97)	4.25 (2.60)
December 2009	1.00 (1.72)	5.31 (2.90)	5.63 (1.93)

to be sexually experienced, reported more intimate friendships, and more parent behavioural control.

Class membership probabilities. Table 10 shows the initial probabilities of belonging to each of the inexperienced, experimenting, and experienced classes. Controlling for all demographic, personal, peer, and family variables, the probability of being assigned to the inexperienced class is highest, at 78%. The probabilities of being assigned to the experimenting and experienced classes are 6% and 16%, respectively. Variation in age, friends' sexual behaviour, and parent behavioural control were significantly associated with change in probability of belonging to one or another class. Gender, pubertal timing, problem behaviour, maturity, and friendship intimacy did not influence class membership probabilities, and were excluded from the Table. The probability of being assigned to the experimenting and experienced classes was higher for older students and students who reported that more of their friends are sexually experienced. The probability of being assigned to the experimenting class was higher for students who reported more parent behavioural control. The probability of being assigned to the experienced class was almost equal at all levels of parent behavioural control.

Within-class heterogeneity. Table 11 shows that several variables predicted differences in students' initial levels and trajectories of sexual behaviour intimacy over time within each latent class. Findings are organized below by variable type, and differences in trajectories within classes are highlighted.

Table 10

Class Membership Probabilities

	Class		
	Inexperienced	Experimenting	Experienced
Initial probability	.78	.06	.16
Age			
Older	.49	.15	.36
Younger	.93	.02	.05
Friends' sex			
More friends having sex	.37	.28	.35
Fewer friends having sex	.95	.01	.05
Parent behavioural control			
More behavioural control	.50	.38	.12
Less behavioural control	.85	.01	.14

Note. Probabilities are presented for students with values one standard deviation above the mean (older, more friends having sex, more behavioural control) and one standard deviation below the mean (younger, fewer friends having sex, less behavioural control).

Table 11

Effects of Demographic, Personal, Peer, and Family Variables on Within-Class Heterogeneity in Sexual Behaviour Intimacy

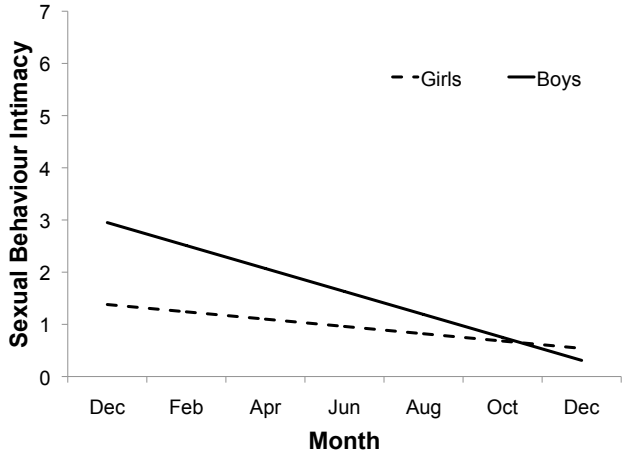
	Class					
	Inexperienced		Experimenting		Experienced	
	B	*SE*	*B*	*SE*	*B*	*SE*
Initial status (intercept: Feb '09)	1.24*	.22	2.54*	.21	3.81*	.55
Male	1.27*	.41	-.25	.26	.51	.62
Age	.39*	.17	-.68*	.16	.76*	.26
Pubertal timing	-.18	.19	1.12*	.25	-1.23*	.19
Problem behaviour	1.01*	.35	-.79	.96	.88	.72
Psychosocial maturity	-.99*	.29	5.23*	.31	-2.79*	.37
Friends' sex	.49*	.20	1.34*	.22	.89*	.27
Friendship intimacy	1.00*	.27	.92*	.19	-1.24*	.42
Parent behavioural control	1.16*	.38	.13	.22	-.99*	.44
Linear rate of change (slope)	-.14*	.07	.74*	.09	-.11	.17
Male	-.30*	.08	.42*	.11	.35*	.18
Age	-.08	.04	-.16*	.04	.00	.08
Pubertal timing	.01	.05	.09	.09	.23*	.04
Problem behaviour	.04	.06	2.03*	.28	-.13	.21
Psychosocial maturity	.15*	.06	-.33*	.11	.39*	.14
Friends' sex	-.12*	.05	-.12*	.04	-.12	.08
Friendship intimacy	-.15*	.06	-.33*	.07	.34*	.12
Parent behavioural control	-.27*	.10	-.17	.12	-.01	.13

*$p < .05$

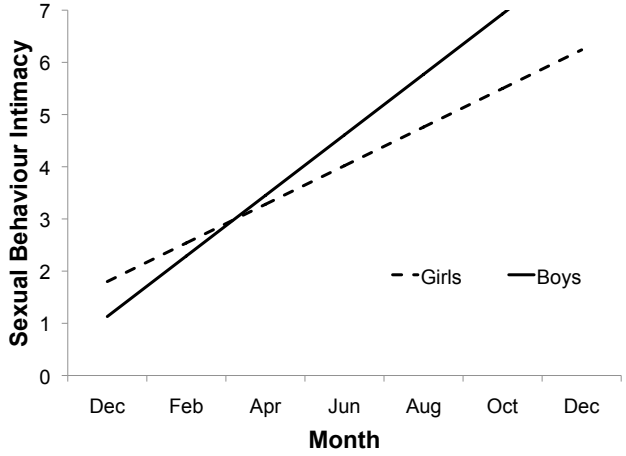
Demographic heterogeneity. Table 11 shows that gender was associated with variation in initial sexual behaviour intimacy for inexperienced students, and with variation in trajectories of sexual behaviour intimacy for inexperienced, experimenting, and experienced students. These relations are depicted in Figure 3. Inexperienced boys reported higher initial sexual behaviour intimacy with declining intimacy over time. Girls' trajectories corresponded to the general trend in this class toward less intimate sexual behaviour over time. Boys and girls classified as experimenting increased the intimacy of their sexual behaviour over time, but boys' slopes were steeper, indicating that boys transitioned from less to more intimate behaviours more quickly than girls. Girls classified as experienced showed slight declines in sexual behaviour intimacy over time, but experienced boys reported more intimate sexual behaviour over time. Age was associated with differences in students' levels of sexual behaviour intimacy in all three classes, but only predicted differences in trajectories within the experimenting class. Older students in the inexperienced and experienced classes reported more intimate sexual behaviours on average, whereas older students in the experimenting class reported lower initial sexual behaviour intimacy. However, as Figure 4 shows, older students transitioned from less to more intimate behaviours more gradually than younger students. Perceived pubertal timing was associated with differences in experimenting and experienced students' levels of sexual behaviour intimacy, but only predicted variation in trajectories within the experienced class (see Figure 5). Students classified as experimenting who reported developing later than their peers also reported more intimate sexual behaviours on average.

Figure 3. Class-Specific Effects of Gender on Initial Levels and Trajectories of Sexual Behaviour Intimacy.

A. Inexperienced class



B. Experimenting class



C. Experienced class

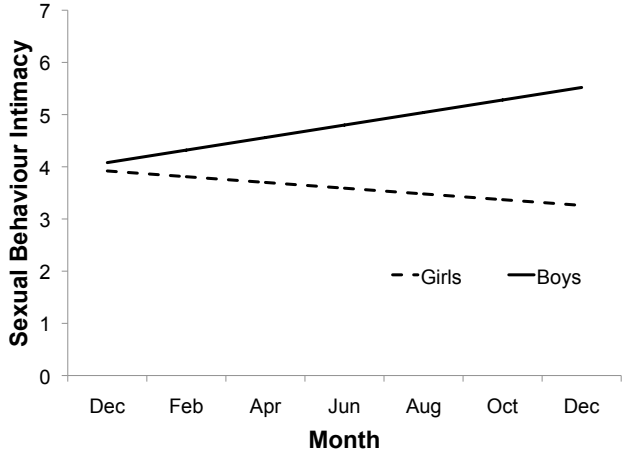
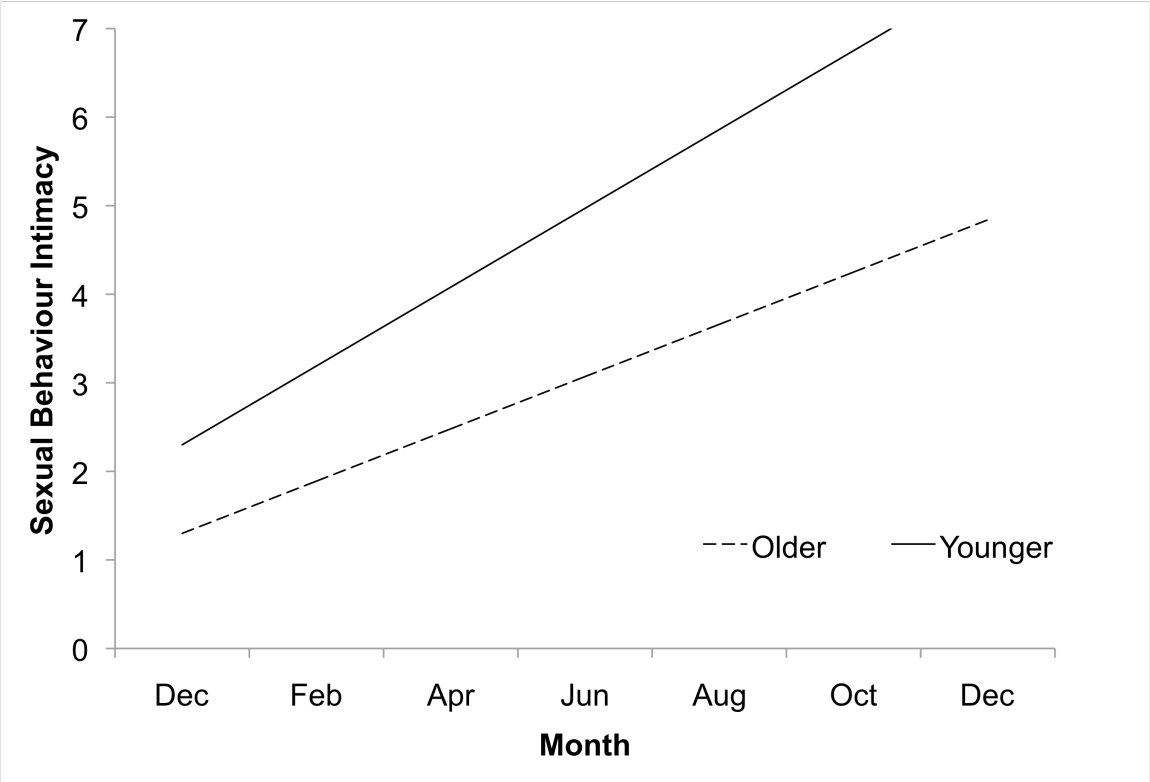
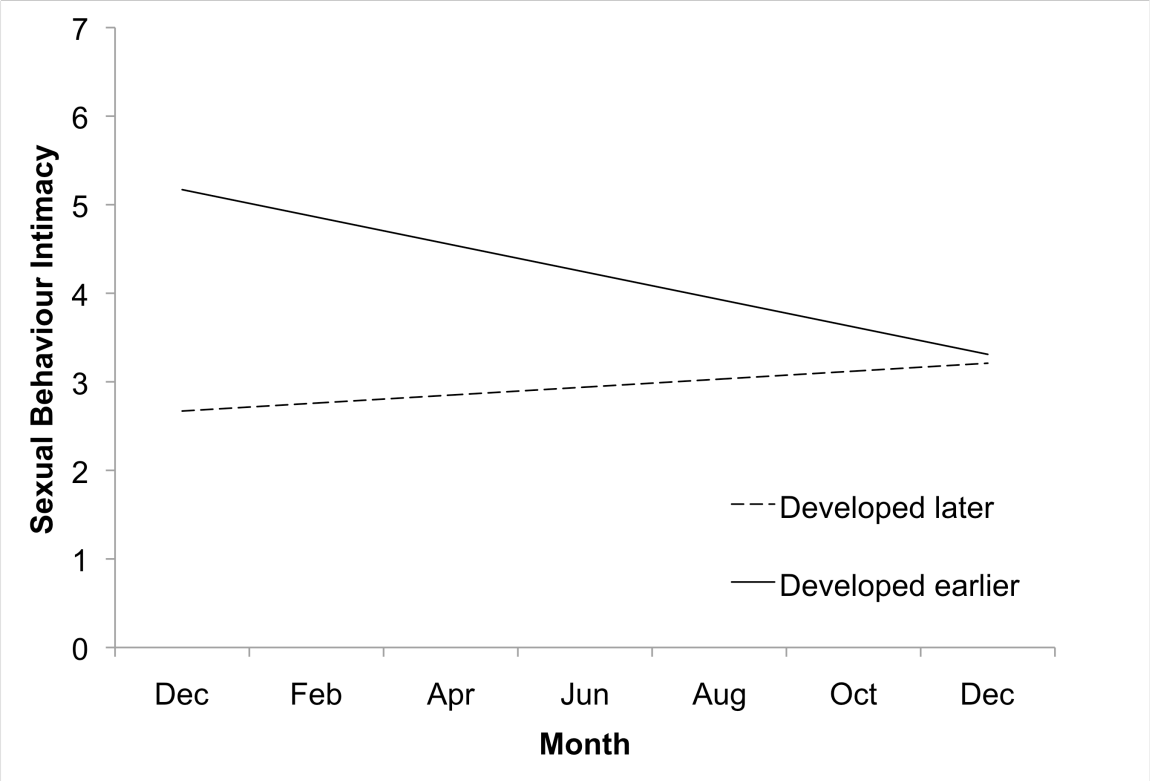


Figure 4. Effect of Age on Initial Level and Trajectory of Sexual Behaviour Intimacy for Students Classified as Experimenting.



Note. Lines represent ages one standard deviation older and younger than the mean age.

Figure 5. Effect of Pubertal Timing on Initial Level and Trajectory of Sexual Behaviour Intimacy for Students Classified as Experienced.



Note. Lines represent pubertal timing one standard deviation later and earlier than the mean.

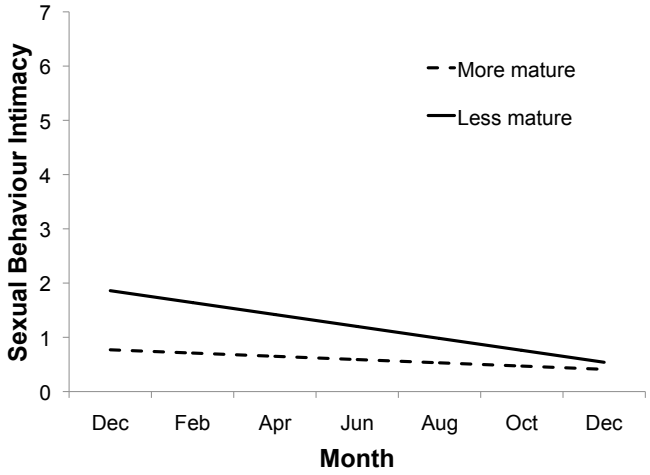
Students classified as experienced who reported developing later than their peers reported less intimate sexual behaviours on average, and stable levels of sexual behaviour intimacy over time. Earlier-developing students in this class had higher initial levels of sexual behaviour intimacy that declined over time.

Personal heterogeneity. Table 11 shows that psychosocial maturity was associated with variation in initial levels and trajectories of sexual behaviour intimacy for students in all three classes. For the inexperienced class, Figure 6, Panel A shows that higher levels of psychosocial maturity predicted lower initial sexual behaviour intimacy and gradually increasing levels of intimacy over time that offset the average declining trend in this class. Lower maturity predicted higher initial sexual behaviour intimacy and steeper, declining levels of intimacy. For the experimenting class, Figure 6, Panel B shows that higher levels of psychosocial maturity predicted higher initial sexual behaviour intimacy but more gradual increases in intimacy over time. Students who reported lower maturity also reported lower initial sexual behaviour intimacy but transitioned more quickly from less to more intimate sexual behaviours. For the experienced class, Figure 6, Panel C shows that higher levels of psychological maturity predicted lower initial sexual behaviour intimacy and gradual increases in intimacy over time. Students who reported lower maturity reported higher initial sexual behaviour intimacy that declined over time.

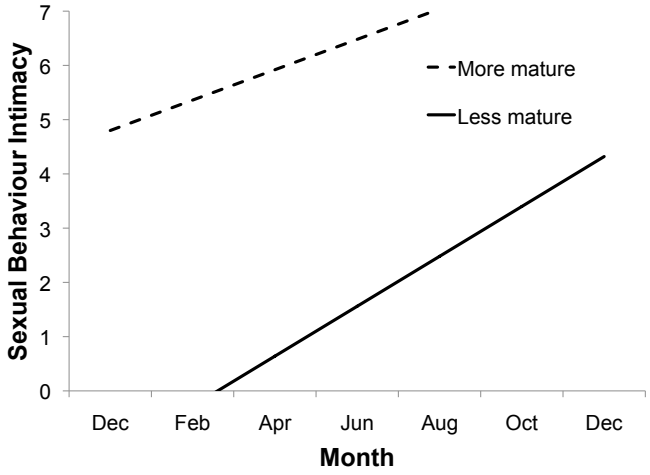
Problem behaviours were associated with higher initial sexual behaviour intimacy for inexperienced students, and with faster increases for experimenting students. In Figure 7, students who reported fewer problem behaviours also

Figure 6. Class-Specific Effects of Psychosocial Maturity on Initial Levels and Trajectories of Sexual Behaviour Intimacy.

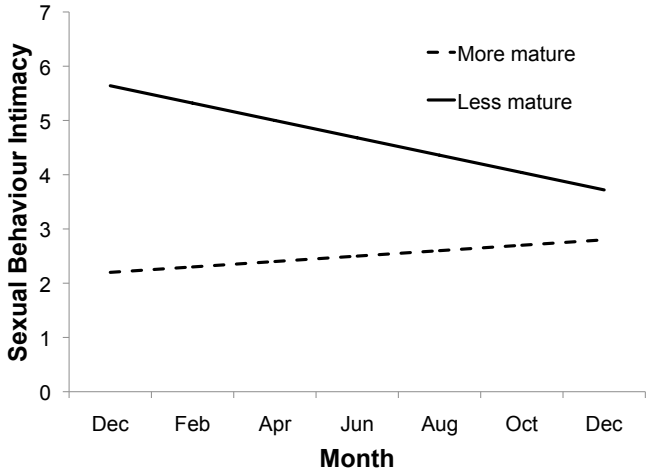
A. Inexperienced class



B. Experimenting class

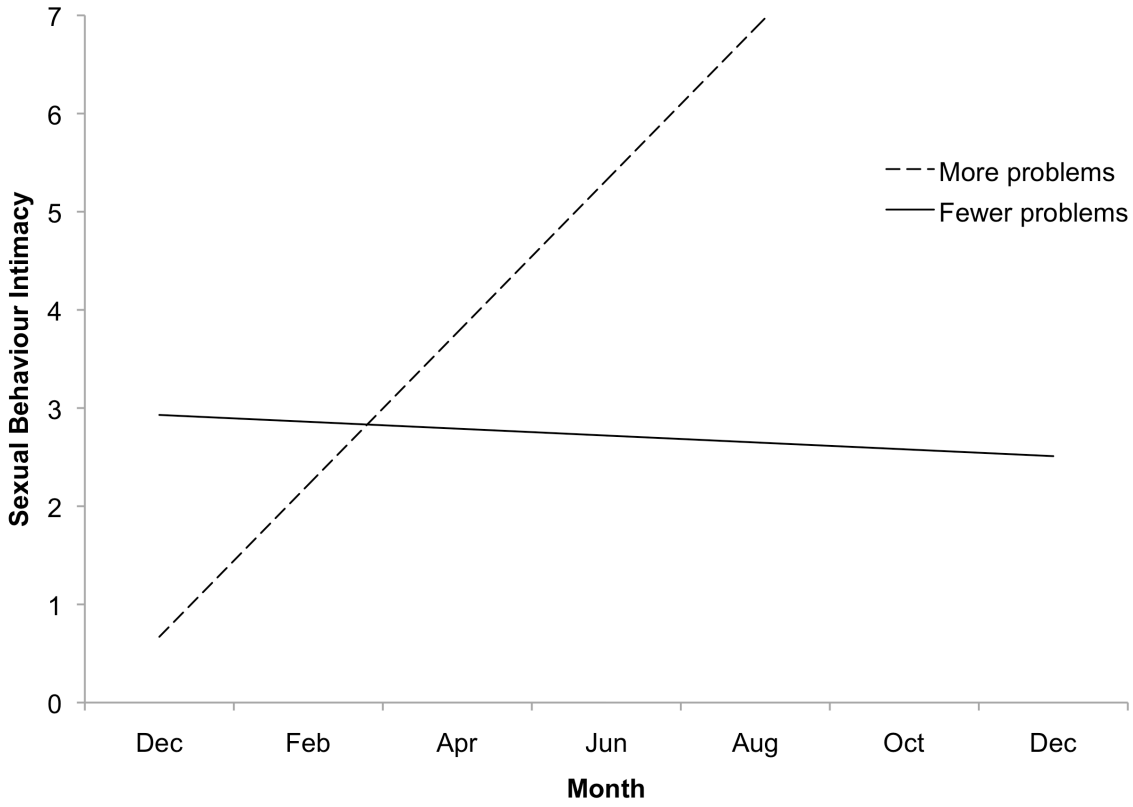


C. Experienced class



Note. Lines represent maturity one standard deviation above and below the mean.

Figure 7. Effect of Problem Behaviour on Initial Level and Trajectory of Sexual Behaviour Intimacy for Students Classified as Experimenting.



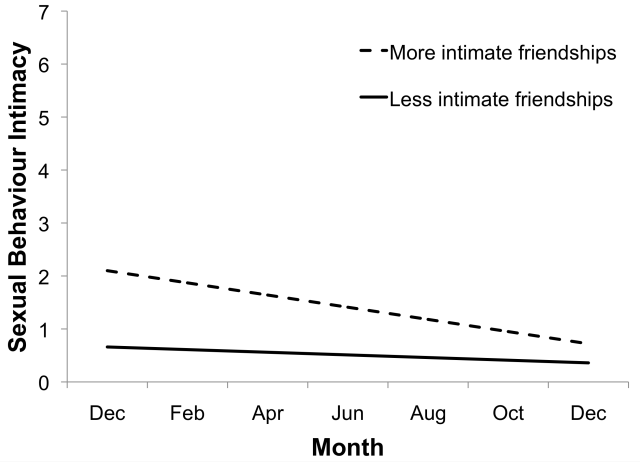
Note. Lines represent problem behaviours one standard deviation above and below the mean.

reported stable levels of sexual behaviour intimacy month-to-month, whereas students who reported more problem behaviours transitioned quickly from less to more intimate sexual behaviours.

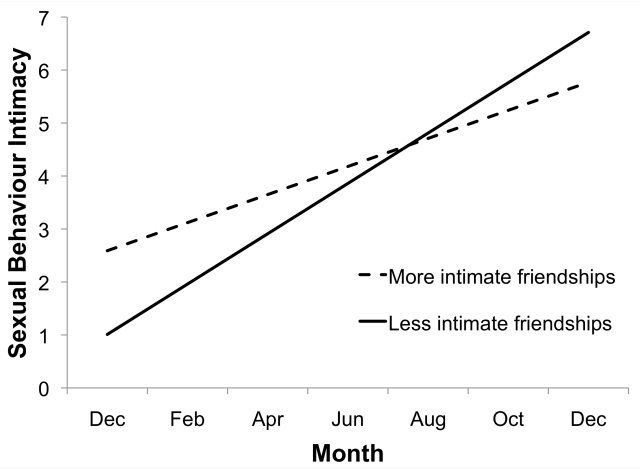
Peer heterogeneity. Table 11 shows that friendship intimacy predicted variation in initial levels and trajectories of sexual behaviour intimacy for students in all classes. For the inexperienced class, Figure 8, Panel A shows that having more intimate friendships predicted higher initial levels of sexual behaviour intimacy that declined over time. For the experimenting class, Figure 8, Panel B shows that having more intimate friendships predicted higher initial levels of sexual behaviour intimacy and more gradual increases over time compared to students who reported less intimate friendships. For the experienced class, Figure 8, Panel C shows that having more intimate friendships predicted lower initial levels of sexual behaviour intimacy and gradual increases in sexual behaviour intimacy over time, whereas students with less intimate friendships reported initially higher but declining sexual behaviour intimacy. Friends' sexual experience also predicted variation in initial levels of sexual behaviour intimacy for students in all classes, but predicted variation in trajectories only for students in the inexperienced and experimenting classes. For the inexperienced class, Figure 9, Panel A shows that perceiving more of your friends to be sexually experienced predicted higher initial levels of sexual behaviour intimacy that declined over time. For the experimenting class, Figure 9, Panel B shows that perceiving more of your friends to be sexually experienced predicted higher initial levels of sexual behaviour intimacy and gradual increases over time. For the

Figure 8. Class-Specific Effects of Friendship Intimacy on Initial Levels and Trajectories of Sexual Behaviour Intimacy

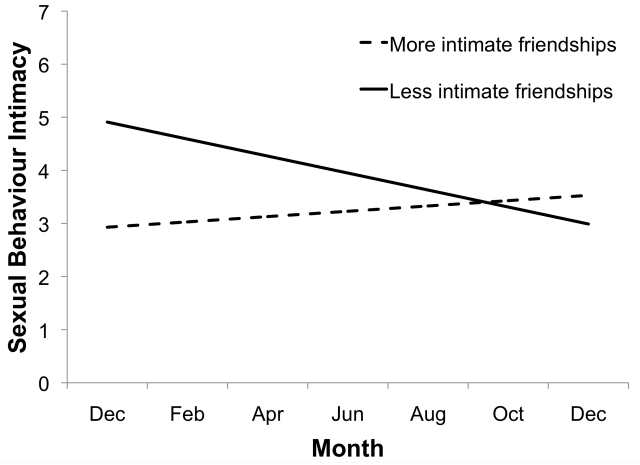
A. Inexperienced class



B. Experimenting class



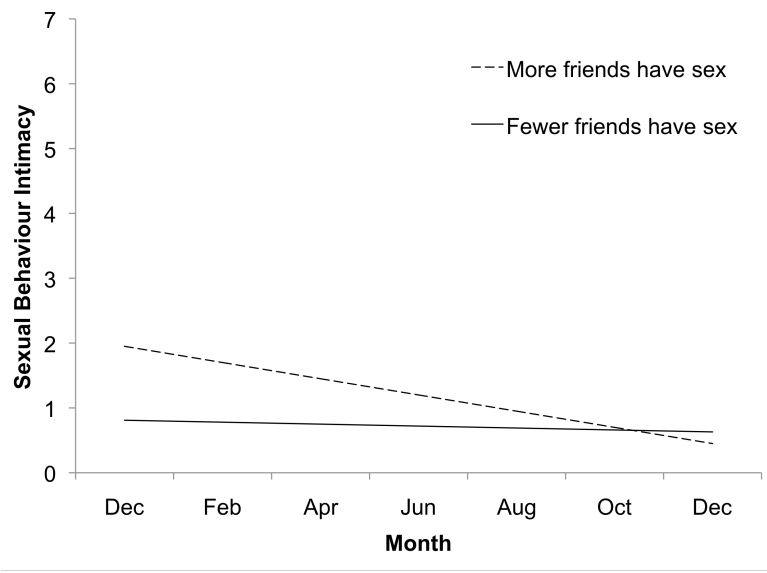
C. Experienced class



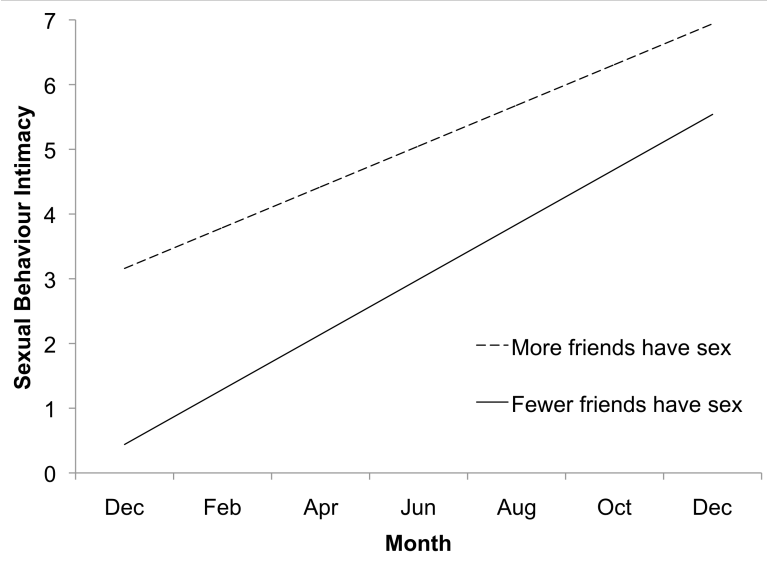
Note. Lines represent friendship intimacy scores one standard deviation above and below the mean.

Figure 9. Class-Specific Effects of Friends' Sexual Experience on Initial Levels and Trajectories of Sexual Behaviour Intimacy.

A. Inexperienced class



B. Experimenting class



Note. Lines represent perceptions of friends' sexual experience one standard deviation above and below the mean.

experienced class, perceiving more of your friends as sexually experienced was associated with higher levels of sexual behaviour intimacy that remained stable over time (no figure).

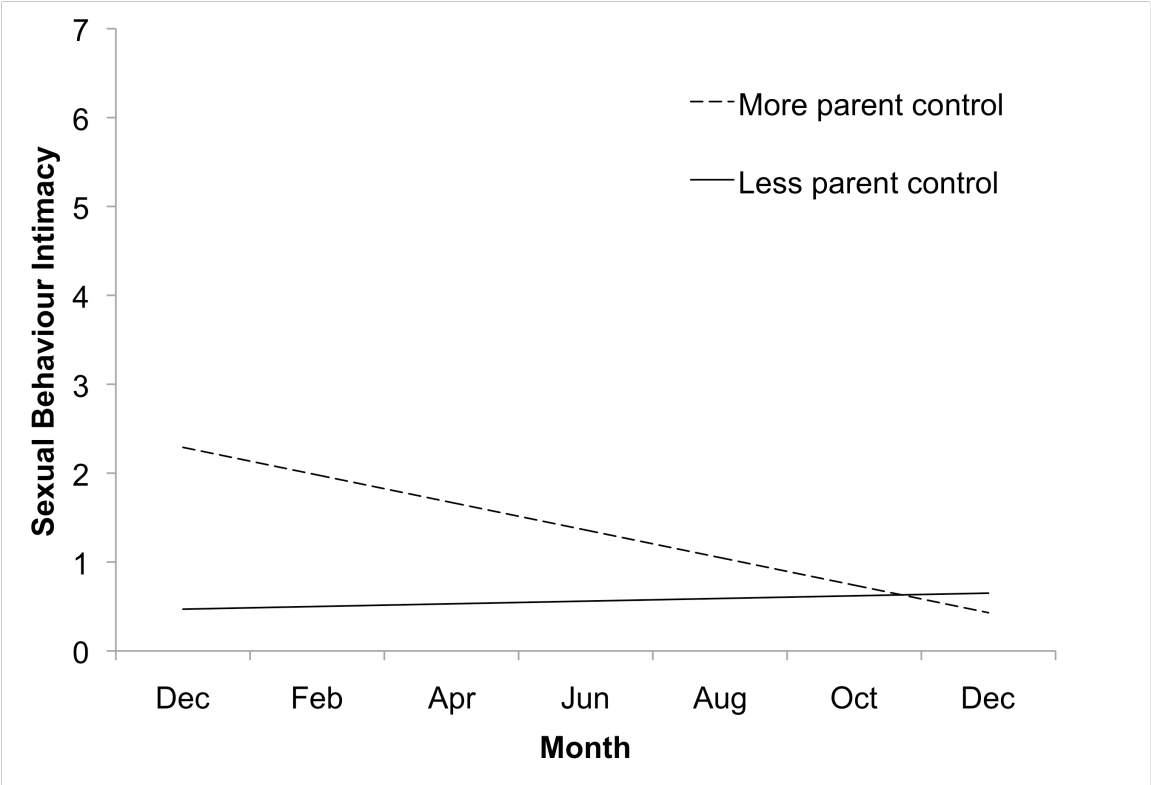
Family heterogeneity. Table 11 shows that parent behavioural control predicted variation in initial levels and trajectories of sexual behaviour intimacy for students in the inexperienced class, and initial levels of sexual behaviour intimacy for students in the experienced class. For the inexperienced class, Figure 10 shows that more behavioural control predicted higher initial levels of sexual behaviour intimacy that declined over time. For the experienced class, more behavioural control predicted lower levels of sexual behaviour intimacy that remained stable over time (no figure). Parent behavioural control did not predict variation in sexual behaviour intimacy within the experimenting class.

Summary

Together, the class-specific descriptive statistics, class membership probabilities, and within-class heterogeneity results can be used to describe and summarize the characteristics of each class identified in this study.

Inexperienced class. Students in the inexperienced class engaged in fewer and less intimate sexual behaviours compared to all other students. Almost half of the students in the sample belonged to this class, and the probability of being classified as inexperienced, controlling for demographic, personal, peer, and family variables was 78%. The probability of being classified as inexperienced was higher for younger students, and students who report having fewer sexually experienced friends and less parent behavioural control. Within-

Figure 10. Effect of Parent Behavioural Control on Initial Level and Trajectory of Sexual Behaviour Intimacy for Students Classified as Inexperienced.



Note. Lines represent parent behavioural control one standard deviation above and below the mean.

class heterogeneity appeared to emerge in one of two patterns across all predictor variables: Students' sexual behaviour intimacy appeared either low and stable across months, or above average and declining across months. Students whose trajectories appeared low and stable were girls, more psychosocially mature, had fewer sexually experienced friends, reported less friendship intimacy, and reported less parent behavioural control. Students whose trajectories appeared to be above average and declining were boys, less psychosocially mature, had more sexually experienced friends, reported more friendship intimacy, and reported more parent behavioural control.

Experimenting class. Students in the experimenting class engaged in sexual behaviours at comparable rates and comparable levels of intimacy to students in the experienced class. About one quarter of students in the sample belonged to this class, and the probability of being classified as experimenting, controlling for demographic, personal, peer, and family variables was just 6%. The probability of being classified as experimenting was higher for older students, and students who reported having more sexually experienced friends and more parent behavioural control. In general, students in this class tended to engage in increasingly intimate sexual behaviours across months, and patterns of within-class heterogeneity across variables appeared to distinguish between students who made gradual versus abrupt transitions from less to more intimate sexual behaviours. Students whose transitions appeared more gradual were girls, older, more psychosocially mature, had fewer problem behaviours, had more sexually experienced friends, and reported more friendship intimacy. Students whose

transitions appeared more abrupt were boys, younger, less psychosocially mature, had more problem behaviours, had fewer sexually experienced friends, and reported less friendship intimacy.

Experienced class. Students in the experienced class engaged in sexual behaviours at comparable rates and comparable levels of intimacy to students in the experimenting class. About 30% of students in the sample belonged to this class, and the probability of being classified as experienced, controlling for demographic, personal, peer, and family variables was 16%. The probability of being classified as experienced was higher for older students and students who reported having more sexually experienced friends. Students in this class reported more intimate sexual behaviours at stable levels across months. However, patterns of within-class heterogeneity across variables appeared to distinguish between students who initially reported more intimate sexual behaviours that declined across months and students whose sexual behaviour intimacy was lower to average for the class and either gradually increased or remained stable across months. Students whose trajectories appeared to be high and declining had earlier pubertal timing, were less psychosocially mature, had more sexually experienced friends, and reported less friendship intimacy. Students whose trajectories appeared to follow a low/average and stable/increasing pattern had later pubertal timing, were more psychosocially mature, had fewer sexually experienced friends, and reported more friendship intimacy. Gender heterogeneity did not follow either of these patterns. Boys and girls in the experienced class reported similar initial levels of sexual behaviour intimacy, but boys' sexual behaviour became more

intimate over time, whereas girls' sexual behaviour became slightly less intimate over time.

CHAPTER IV

Discussion

This study explored profiles of adolescent sexual behaviour, tracked once every two months over one year. Heterogeneity was deconstructed by testing for the presence of sub-populations of adolescents (represented by latent classes) who exhibited similar patterns of sexual behaviour intimacy. Heterogeneity was further explored by testing whether proximal risk and protective-enhancing factors influenced the probability of belonging to a given class, and whether the same factors explained residual heterogeneity within classes. The following sections summarize the results of these tests and situate the results within the high-risk and normative perspectives on adolescent sexual behaviour, guided by a person-centered, developmental systems approach. Limitations and strengths of this study and directions for future research follow.

Sexual Behaviour Intimacy Classes

The first research question concerned whether adolescents' trajectories of sexual behaviour intimacy could be represented by two or more classes with distinct intercepts and slopes. Three latent classes were identified, labeled *inexperienced*, *experimenting*, and *experienced* (see Figure 2, p. 51). Students classified as inexperienced primarily reported only lower-intimacy, non-genital sexual behaviours across months; many reported no sexual behaviours at all. Students classified as experimenting and experienced reported similar levels of sexual behaviour intimacy across months. Most engaged in genital behaviours at some point, and half engaged in sexual intercourse. Experimenting students'

sexual behaviours, however, appeared to increase gradually from less to more intimate, month to month. Experienced students reported higher-intimacy behaviours at a stable rate across months, but month-to-month transitions from lower- to higher-intimacy behaviours appeared more abrupt compared to experimenting students.

By relaxing the assumption that adolescents' individual trajectories of sexual behaviour intimacy derive from a single population, this analysis showed that adolescent sexual behaviour is heterogeneous. Grouping together similar trajectories reduced some heterogeneity. These results are consistent with other studies that found heterogeneity in adolescent sexual behaviour (de Graaf et al., 2009; Miller et al., 1997; Moilanen et al., 2010; Murphy et al., 2009). However, this study improved on previous research by considering a range of non-coital behaviours in addition to intercourse (cf. Moilanen et al., Murphy et al.), by tracking adolescents' sexual behaviours over time (cf. Miller et al.), and by capturing short-term, intraindividual variation as adolescents transition between less and more intimate sexual behaviours (cf. de Graaf et al.).

In addition to identifying latent classes with similar profiles of sexual behaviour intimacy, the person-centered analytic strategy used in this study permitted class-specific interindividual differences. In other words, different relations between sexual behaviour intimacy and demographic, personal, peer, and family variables emerged for students classified as inexperienced, experimenting, and experienced. The next section includes a discussion of the roles of risk and protective-enhancing factors in determining class membership,

and in predicting within-class heterogeneity in trajectories of sexual behaviour intimacy.

Class Membership Profiles

The second research question concerned whether adolescents were more or less likely to exhibit a given profile of sexual behaviour intimacy, depending on their reports of demographic, personal, peer, and family characteristics. Age, perceptions of friends' sexual experience, and parent behavioural control emerged as variables associated with class membership.

Younger adolescents had the highest probability of belonging to the inexperienced class. Similar proportions of older adolescents belonged to the experimenting and experienced classes, relative to initial probabilities. The concentration of younger adolescents in the inexperienced class suggests that the lower levels of sexual behaviour intimacy observed in this class may be due to inexperience associated with age rather than personal choice to abstain from genital touching, oral sex, and intercourse. Adolescents who perceived that few of their friends were sexually experienced also had the highest probability of belonging to the inexperienced class. This finding is consistent with the literature: adolescents who think their friends are having sex are more likely to have sex themselves (Kinsman et al., 1998).

Finally, parent behavioural control was related to class membership assignment. Interestingly, adolescents who reported the lowest levels of behavioural control were most likely to belong to the inexperienced class. Reporting higher behavioural control was associated with a greater probability of

being assigned to the experimenting class, but assignment to the experienced class was similar at all levels of parent behavioural control. Parents of inexperienced students exercised the least control over their children's behaviour and activities, and parents of experimenting students exercised the most control. This pattern may reflect levels of control that fit adolescents' actual behaviours and developmental needs (Galambos et al., 2003; Pettit et al., 2001). Parents of inexperienced students may recognize that their children are not engaging in sufficiently risky behaviour to warrant vigilant monitoring and control. In contrast, parents of experimenting students may recognize that their children are experimenting with activities that carry some risk, and exercise an appropriate degree of control in response. Experienced students, however, reported variable levels of parent control. In addition to behaviourally-appropriate control, parents of experienced students may provide too little and too much control. These interpretations could be strengthened by comparison to another measure of parent behaviour, such as support. Researchers should consider incorporating multiple family measures in subsequent studies assessing heterogeneity in adolescent sexual behaviour.

These profiles describe the typical characteristics of adolescents within each class, providing additional interpretive power to the patterns of sexual behaviour intimacy observed in each class. Inexperienced students were younger, had fewer sexually experienced friends, and had parents who exercised less behavioural control. This profile suggests that these students experimented with few sexual behaviours, and may not have engaged with social contexts that were

likely to place them at risk for problems typically associated with sexual behaviour, at least in the short term. Experimenting students were older, had more sexually experienced friends, and had parents who regulated their behaviour and activities. This profile suggests that most of these students experimented with intimate sexual behaviours that carry significant risks, but that risks may have been mitigated by the presence of vigilant parent control. Experienced students resembled experimenting students, but reported lower levels and no typical pattern of parent behavioural control. Compared to experimenting students, experienced students may have lacked an important family-based protective resource. These profiles are consistent with the multiple pathways proposed by Zimmer-Gembeck and Helfand (2008): Among adolescents actively engaging in intimate sexual behaviours, some may be at greater risk for adverse developmental and health-related outcomes (experienced) than others (experimenting).

It bodes well for future research that patterns of sexual behaviour emerged in this study that are consistent with theory and with previous studies from both the high-risk and normative perspectives. As discussed in the next section, however, there is substantial within-class heterogeneity that is explained by relations between class-specific trajectories of sexual behaviour intimacy and the demographic, personal, peer, and family variables included in this study.

Within-Class Heterogeneity

The final research question concerned whether demographic, personal, peer, and family variables could explain class-specific variability in adolescents'

trajectories of sexual behaviour intimacy. Many significant relations emerged, and patterns of relations varied across classes.

Inexperienced class. Trajectories of sexual behaviour intimacy appeared to follow two distinct patterns in the inexperienced class. Students' sexual behaviour intimacy appeared either low and stable across months, or above average and declining across months. The profile of the inexperienced class discussed above suggests that in general, members of this class were sexually inexperienced. Some members presented fewer risk factors and more protective-enhancing factors than others. Adolescents whose trajectories appeared low and stable were female and had fewer sexually experienced friends, variables that predicted less sexual experience (e.g., Carvajal et al., 1999; Prinstein et al., 2003) and less risky sexual behaviour (e.g., Bachanas et al., 2002; Herlitz & Ramstedt, 2005) in other studies. A trajectory that appeared low and stable was also associated with higher psychosocial maturity. Adolescents fitting the inexperienced profile who also reported lower-intimacy sexual behaviours at stable rates across months had the advantage of a personal resource that can promote successful development (Dalton & Galambos, 2009; Galambos, Barker, & Tilton-Weaver, 2003). The association between a trajectory that appeared low and stable and less parent behavioural control also suggests that these adolescents engaged in activities that required very little regulation.

In contrast, adolescents whose trajectories appeared to be above-average and declining presented more risk factors (more sexually experienced friends), lacked the personal resource of psychosocial maturity, and reported more parent

behavioural control. Perhaps adolescents who engaged in more intimate sexual behaviours and withdrew to less intimate behaviours over time initiated behaviours for which they were not emotionally prepared. Other studies showed that adolescents who initiated intercourse at younger ages were more likely to regret the experience (Wellings et al., 2001; Wight et al., 2008). Regretted sexual experiences were also associated with substance use and school problems (Erickson & Rapkin, 1991).

The two patterns of sexual behaviour intimacy in this class raise questions about how experiences with lower-intimacy behaviours may be related to experimentation with higher-intimacy behaviours later in adolescence. Perhaps adolescents who presented fewer risk factors and more protective factors in relation to their lower-intimacy behaviours are already on a path that carries low risk for negative sexual experiences later on.

There still remains the puzzling relation that greater friendship intimacy – proposed as a protective-enhancing peer resource – was associated with an apparently above-average and declining trajectory of sexual behaviour intimacy. One explanation for this finding is that adolescents in the inexperienced class were not yet psychologically equipped to handle emotionally intimate friendships. For adolescents in the inexperienced class – people who were younger and had fewer sexually experienced friends – highly intimate friendships may be related to engaging in sexual behaviour that is too intimate for one's age and level of readiness.

Experimenting class. Trajectories of sexual behaviour intimacy followed one of two patterns in the experimenting class. Students' transitions from less to more intimate sexual behaviours appeared to be more gradual or more abrupt. The profile of the experimenting class discussed previously suggests that in general, members of this class were sexually experienced but the pattern of individual trajectories appeared to differ from adolescents in the experienced class. Trajectories that appeared more gradual were associated with being female, older age, higher psychosocial maturity, fewer problem behaviours, having more sexually experienced friends, and greater friendship intimacy. Female sex and higher psychosocial maturity are relations consistent with the low and stable trajectory of the inexperienced class. Gradual trajectories were associated with older ages of initiating sexual intercourse in one study (de Graaf et al., 2009). Fewer problem behaviours and more intimate and supportive friendships are also associated with fewer sexual risk behaviours (e.g., Boislard et al., 2009; Miller et al., 2002).

In contrast, adolescents whose transitions from less to more intimate sexual behaviours appeared more abrupt presented more risk factors (younger age, more problem behaviours), and lacked personal (psychosocial maturity) and peer (friendship intimacy) resources. Adolescents who presented these risks may have made more impulsive decisions about engaging in more intimate sexual behaviours, possibly due to poor partner communication skills, and external motivations such as partner pressure or to impress friends (de Graaf et al., 2009; Smith & Udry, 1985).

As with the inexperienced class, there remains a puzzling relation: Perceiving more of one's friends to be sexually experienced – proposed as a risk factor – was associated with gradual transitions from less to more intimate sexual behaviours. This relation may simply reflect consistency or lack thereof between adolescents' own sexual behaviour and what they think their friends are doing. Adolescents who made gradual transitions may have perceived that their sexual behaviours were on par with those of their peers, whereas adolescents who made abrupt transitions – possibly reflecting more implusive sexual decision-making – may have believed that they were engaging in more intimate behaviours compared to their friends. Perhaps this discordance increased adolescents' awareness that their sexual behaviours were "off-time" and therefore – according to Jessor and Jessor's (1975) problem behaviour theory – deviant.

Experienced class. Trajectories of sexual behaviour intimacy followed several patterns in the experienced class that appeared to fall into two main categories: Sexual behaviour intimacy appeared either higher than average and declining across months or it was average to lower than average, and appeared to remain stable or gradually increase across months. In general, members of this class were sexually experienced, but individual trajectories appeared to differ from adolescents in the experimenting class. Trajectories that appeared to be high and declining were associated with earlier pubertal timing, lower psychosocial maturity, having more sexually experienced friends, and less friendship intimacy. Although this relation did not emerge for the other two classes, reaching puberty earlier can be a risk factor for initiating intercourse at younger ages (e.g., Capaldi

et al., 1996). In all classes, lower psychosocial maturity was associated with trajectories that were related to the presence of more risk factors and fewer protective-enhancing factors. Consistent with the above average and declining pattern observed in the inexperienced class, experienced adolescents whose sexual behaviour intimacy appeared to be high and declining perceived that more of their friends were sexually experienced. Consistent with the abrupt transitions pattern observed in the experimenting class, experienced adolescents whose sexual behaviour intimacy appeared to be high and declining reported less intimate friendships.

In contrast, adolescents who reported less intimate sexual behaviours that appeared to either increase gradually or remain stable presented fewer risk factors (later pubertal timing, fewer sexually experienced friends), and reported higher levels of personal (psychosocial maturity) and peer (friendship intimacy) resources. The relation between gender and trajectories of sexual behaviour intimacy did not follow a pattern consistent with other predictors of within-class heterogeneity in the experienced class. Experienced boys engaged in more intimate sexual behaviours over time, whereas experienced girls engaged in less intimate behaviours over time. Gender differences are assessed in most sexuality studies, and men tend to report initiating intercourse at younger ages, engaging in intercourse more frequently, having more sexual partners, and having more permissive attitudes toward sexual behaviour in general, and toward casual sex in particular. Women, in contrast, consistently report more fear, anxiety, and guilt about sex (Petersen & Hyde, 2010). Perhaps these differences begin to emerge in

adolescence, as sexually experienced boys engage themselves further in opportunities to experiment with sexual behaviour, whereas sexually experienced girls withdraw from or choose more selectively their subsequent sexual encounters.

Findings of substantial within-class heterogeneity highlight the importance of considering both the risk potential of sexual behaviour in adolescence and the potential for sex in adolescence to play a preparatory role toward healthy adult sexuality. In this study, risk and protective-enhancing factors were associated with stability and gradual increases from less to more intimate sexual behaviours as well as decline, withdrawal, and abrupt increases from less to more intimate sexual behaviours in patterns that varied across classes.

By allowing relations between sexual behaviour intimacy and demographic, personal, peer, and family factors to vary class-to-class, this study showcases the advantages of accounting for heterogeneity in adolescent sexual behaviour. Intimate friendships, for example, were associated with trajectories that appeared stable and gradual for adolescents who reported more intimate sexual behaviours (experimenting and experienced classes), but were associated with trajectories that appeared to decline for adolescents in the inexperienced class. In this study, friendship intimacy and friends' sexual experience were two variables that operated in opposing directions across classes. Such patterns are consistent with the diversity assumption of developmental systems theories, and with the person-centered view that relations among variables carry different meanings for different groups of people. More generally, heterogeneity found in

this study across and within classes supports Zimmer-Gembeck and Helfand's (2008) argument that longitudinal studies of adolescent sexual behaviour must consider and test for the presence of multiple pathways that differentiate adolescents whose sexual behaviours reflect normative experimentation from adolescents for whom sex is one of several problem behaviours leading to long-term adverse outcomes.

Limitations and Strengths

Some aspects of this study limit the findings, and caution should be exercised in generalizing these results. Sample size was a limitation of this study, due to the lower participation rate that resulted from a recruitment strategy that required consent forms to be mailed back. As noted previously, four- and five-class growth mixture models were not tested because the parameters to be estimated in those models exceeded the number of cases in the data. The smaller sample size in this study limited the complexity of models that could be tested, and also has implications for statistical power to detect significant effects. It is questionable whether similar profiles of heterogeneity would be found in other studies, given the exploratory nature of this study combined with reduced power in the smaller sample.

A related limitation is the use of growth mixture modeling to analyze data in this study. Growth mixture modeling is a new technique for examining unique trajectories in multiple groups when group membership is not known *a priori*. Growth mixture models often encounter convergence problems due to the complex, multi-modal, multidimensional likelihood space from which parameter

estimates are drawn, potentially leading to sub-optimal estimates and spurious findings. Compared to growth models constructed using traditional methods for structural equation modeling, growth mixture models rely more heavily on the assumption that data follow a multivariate normal distribution. Violations of this assumption may result in participants being assigned to groups as a way to capture non-normality in the data, not because of true underlying membership in a sub-population (Bollen & Curran, 2006). Steps were taken in this study to minimize the impact of statistical barriers to the effective use of growth mixture modeling, but their complexity, novelty, and potential for errors and spurious results necessitate replication in future research before drawing firm conclusions.

Another limitation common to studies that use self-report measures of sexual behaviour is that dyadic behaviours are represented from the perspective of just one member of the dyad. In this study, adolescents reported on sexual behaviours with multiple partners across waves of assessment. Adolescents' reports in this study represented successive, bi-monthly cross-sections of dyadic behaviour, and these cross-sections linked together should not be interpreted as representations of true developmental trajectories of sexual behaviour intimacy.

Information from both members of a dyad, followed over time, is needed to draw conclusions about processes of change in partnered sexual behaviour. Ideally, a single dyad would be followed over time to ensure consistent measurement of sexual behaviour changes. In this study, however, half or more of participants reported multiple partners across months. Given the concerns about statistical power raised previously, possible analyses in this study would have

been severely restricted had the sample been limited only to adolescents who contributed reports about a single sexual partner across months.

Other limitations of this study include exclusive reliance on self-report measures and lack of attention to issues relevant to sexual minority youth. Although sexual behaviour measures did not exclude the behaviours of same-sex couples, the sexual behaviour intimacy measure is most applicable to the partnered behaviours of opposite-sex couples.

These limitations, however, should be considered in light of the many strengths of this study. Despite the smaller sample size, participants in this study constituted a reasonable cross-section of City of Edmonton demographics. Many participants in this study came from low-income schools, single-parent families, were visible minorities, and had less-educated parents. This representativeness improves the generalizability of these results to Edmonton youth and adolescents in demographically similar communities. In addition, despite the caution warranted in interpreting results, the complex analytic method of growth mixture modeling is a strength of this study. Empirical examples (de Graaf et al., 2009; Miller et al., 1997; Moilanen et al., 2010; Murphy et al., 2009) suggest that heterogeneous patterns of adolescent sexual behaviour do represent multiple sub-populations and not deviations from the grand mean of a single population. This study is the first to model these sub-populations as latent trajectory classes representing a broad range of sexual behaviours. There is some risk involved in using emerging analytic techniques that have not been broadly applied to substantive research questions, but the potential benefits of addressing a

significant gap in prior adolescent sexual behaviour research outweigh the potential costs.

Two strengths of this study are its general contributions to the adolescent sexual behaviour literature. First, the continuous measure of sexual behaviour intimacy used in this study has an advantage over typical dichotomous measures in its ability to capture variability in a range of sexual behaviours, including six non-coital behaviours in addition to intercourse. Typical methods for measuring sexual behaviours ignore most or all non-coital behaviours, treating adolescents not engaging in intercourse as a homogeneous group. Another advantage of this measure is that normative behaviours, rather than sexual risk behaviours, are the focus. Thus, differences among adolescents who reported a range of lower-risk sexual behaviours were considered. Methods for measuring sexual risk behaviours are valuable, but treat adolescents who do not report risky sexual activities as a homogeneous group.

Second, this study reconciles the high-risk and normative perspectives in the adolescent sexual behaviour literature by simultaneously accounting for the influence of risk factors and protective-enhancing factors on trajectories of sexual behaviour intimacy. Notably, relations between trajectories of sexual behaviour intimacy and peer variables used as risk (friends' sexual experience) and protective-enhancing (friendship intimacy) factors varied across classes such that peer "risk" played a protective role in the experimenting class, and peer "protection" played a risk-promoting role in the inexperienced class. These class-specific results reveal diverse functioning that can be masked by analyses that

consider only deviations from a single group mean. Analyses in this study showed diversity in changing relations between individual adolescents' sexual behaviours and demographic, personal, peer, and family variables. This study supports the view held by many contemporary scholars that it is no longer acceptable to focus exclusively on the risk potential of adolescent sexual behaviour in research (e.g., Ehrhardt, 1996), but also shows that risks cannot be discounted when examining ways to promote successful development that include healthy experimentation with sexual behaviour in adolescence.

Future Directions

This study showed that heterogeneity in adolescent sexual behaviour can be deconstructed to reveal multiple distinct classes that more accurately describe patterns of variation in sexual behaviour intimacy. However, interpretations of the meaning of between- and within-class relations of sexual behaviour intimacy with risk and protective factors remain speculative until relations between sexual behaviour intimacy profiles and indicators of subsequent successful development are examined empirically.

Next steps for future research may be to track the sexual behaviours of a larger sample of adolescents for at least one year, and conduct follow-up surveys during the transition to adulthood. An assessment of the relations between sexual behaviour class membership and indicators of a successful transition to adulthood would confirm or refute inferences made in this study about the meaning of belonging to a specific class, or of exhibiting a specific within-class pattern of sexual behaviour.

Conclusion

This study represents an important step forward in adolescent sexual behaviour research, and makes three key contributions. First, results suggest that there are multiple pathways for experimenting with sexual behaviour in adolescence, some of which may have more positive implications for success in development than others. Second, non-coital sex plays an important role in elucidating these diverse pathways, and should continue to be measured in future studies. Third, risk and protective-enhancing factors that explain heterogeneity in these pathways operate differently for different people. It is the interaction of such variables with other characteristics of the individual, situated within proximal and distal contexts of influence, that determine what conditions are likely to enhance or diminish potential for successful development.

Two perspectives guiding research on adolescent sexual behaviour were discussed earlier. The so-called high-risk perspective characterizes studies that emphasize relations between adolescent sexual behaviour and adverse behavioural, psychological, and health outcomes. The so-called normative perspective characterizes studies that emphasize ways in which responsible sexual behaviour is related to positive outcomes and healthy adult sexuality. Given the dominance of the high-risk perspective, the views of scholars who write from a normative perspective have received limited empirical support. Perhaps the most important contribution of this study, then, is that it helps to bring a sense of balance to an unbalanced field of study. A key assumption of this study was that some adolescents likely engage in sexual behaviours in a way that promotes risk

for adverse outcomes, whereas other adolescents likely engage in sexual behaviours in a way that carries little risk and may promote positive outcomes. This study showed that adolescents who exhibit specific sexual behaviour patterns can be distinguished from other adolescents who exhibit different sexual behaviour patterns. Importantly, these results do not support the notion that intimate sexual behaviours unilaterally place adolescents at risk for adverse outcomes. Recognizing the potential for multiple, diverse pathways of experimentation with sexual behaviour, researchers may now proceed with greater awareness of the preconceptions that shape our empirical beliefs about what makes adolescent sex risky or normative.

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APPENDIX A

Edmonton Social Pathways Project: Interest Form

You are invited to participate in a project about adolescent sexuality and social behaviour. I'm interested in learning about the different kinds of social and sexual behaviours that **do** and **don't** happen among high school students in Edmonton. Today, I'd like to find out whether or not you are interested in learning more about my project, and possibly being a participant.

If you think you might be interested but you're not sure, you can always change your mind later!

If you're interested in learning more about my project, please check the box marked "YES" below, and fill out the rest of the form so that I will be able to contact you. For everyone under 18, a parent or guardian will have to complete a consent form before you are able to participate.

☐ **YES** Please contact me with more information about the project. *I'm not agreeing to participate*, but I am interested in learning more.

☐ **NO** Thanks, but I'm definitely not interested in participating and I definitely don't want to learn more about this project.

If you checked "yes," please fill out the contact information below. This information *will not be shared* with anyone not directly working on my project:

Your Name: _____**Grade**: _____

E-mail address: _____

Please tell me your **preferred** method(s) of online communication and how to contact you:

☐ **E-mail**

☐ **Instant messaging** (Windows/MSN messenger, AIM, ICQ, etc.)
*which IM service(s) can we use to contact you:*_____
identity/user name: _____

☐ **Social networking** (Facebook, Nexopia, MySpace, etc.)
which networking site(s) can we use to contact you: _____
identity/user name: _____

☐ **Other**
please tell us which other method we can use to contact you, and how to get in touch:
_____
_____

Thank you for your help! Please **return this form to the front** when you're finished.

APPENDIX B

Important Information for Parents

Dear Parents (and Student),

I am writing to invite your child to participate in the *Edmonton Social Pathways Project*, a study that I am conducting among grade 10, 11, and 12 students in your child's school in 2008/2009. As a graduate student focusing on developmental psychology, I am interested in finding out more about growth and changes in younger and older adolescents' presexual and sexual behaviours (e.g., kissing, touching, intercourse), and characteristics of adolescents who do and do not engage in these different kinds of behaviours. Over the past few years, I have helped to conduct similar research on this and other health behaviour topics in older adolescents, and have found it to be a worthwhile experience for me and the participants. One of the things I have found is that being sexually active is related to positive emotional experiences for older adolescents (aged 17-19) who are psychosocially mature, but is also related to negative emotional experiences for psychosocially immature adolescents.

The purpose of this project is to examine patterns of change in adolescents' sexual behaviours over a one-year period. Adolescence is a significant period of sexual development because many youth begin to experiment with a variety of sexual behaviours, learn about intimacy, and prepare for adult relationships. This experimentation also carries some risk, for example, pregnancy and transmission of infections among adolescents engaging in intercourse. About half of all Canadian adolescents will have experimented with sexual intercourse by age 17, so, I am interested in learning about how sexual behaviours develop and change, and finding out the factors that indicate which adolescents are at a higher vs. lower risk of experiencing negative consequences. To do this, I need to ask adolescents like yours about which sexual behaviours they do or do not engage in, and also about other aspects of their life including how old they feel, how well they get along with friends, things they do with their friends and family, how they help out in their neighbourhood or community, whether they participate in any risky activities, and what role spirituality/religion plays in their lives.

If your son or daughter is interested in taking part in this study, he/she will spend about 30 minutes once every two months filling out a survey online. Let me assure you that all surveys collected online will be identified only by a code number and not by name. Please note that we are not interested in individual responses, but in adolescents as a group.

Each student who participates will receive a gift card to a mall of their choice worth $10 for each submitted survey, up to a maximum value of $60 for submitting all six online surveys. We are also offering an incentive for students whose parents or guardians return a completed consent form. Each student whose parent/guardian returns a completed consent form will receive a movie pass redeemable at any Cineplex Odeon/Galaxy theatre. Your child will receive this gift ***even if you do not consent to their participation in the project***, as long as you return the completed form in the enclosed self-addressed, stamped envelope.

It is also important that you know that your child's participation is entirely voluntary and that your child may stop participating at any time, without consequences (i.e., your child's participation or nonparticipation will have no bearing on their grades or standing at school). Your child may request at any time that any or all of the information collected be removed from the project and deleted.

Please complete and return the enclosed consent form, whether or not you would like your child to participate in this study.

If you or your child have any concerns or questions about this project, please feel free to call (780-492-7447) or email (andrea.dalton@ualberta.ca) me at any time.

Sincerely,

Andrea Dalton
Department of Psychology, University of Alberta
Tel. 780-492-7447 **E-mail**. andrea.dalton@ualberta.ca

APPENDIX C

Edmonton Social Pathways Project: CONSENT

Return this form in the enclosed self-addressed, stamped envelope for your child to receive a movie pass.
Your child will receive this thank-you gift WHETHER OR NOT you consent to his/her participation in this project.

PURPOSE

Your child is invited to participate in a study (*Edmonton Social Pathways Project*) conducted by Andrea Dalton, a doctoral student in the Department of Psychology at the University of Alberta, under the supervision of Dr. Nancy Galambos. This study examines patterns of change in adolescents' sexual behaviours over a one-year period. We are interested in (1) self-reports of your child's engagement or non-engagement in presexual and sexual behaviours (e.g., kissing, touching, intercourse), (2) your child's personal characteristics such as age, maturity, and emotions, (3) your child's social characteristics such as friendships, social skills, and social isolation experiences, (4) your child's behavioural characteristics such as disobedience, substance use, volunteerism, and school engagement, and (5) the ways in which these personal, social, and behavioural characteristics are related to changes over time in presexual and sexual behaviours. Please note that there will be some explicit questions about sex (e.g., "Please tell us whether or not you have ever engaged in sexual intercourse [penis in vagina]").

PARTICIPATION

Your child's participation involves completing and submitting an online questionnaire once every two months for one year. The questionnaire should take no longer than 30 minutes to complete.

As compensation for his or her time, your child will receive a gift certificate worth $10 for every questionnaire submitted online, redeemable at the mall of his/her choice, to a maximum of $60. The gift certificate will be mailed to your child at the end of the study.

RIGHTS

Your child's participation in this study is voluntary. You or your child may decide at any time to withdraw by calling 780-492-7447 or emailing andrea.dalton@ualberta.ca with your child's name, informing us that you wish to withdraw. If your child begins answering questions in our online survey, and you or your child changes their mind about participating, it is important to withdraw your responses by calling or emailing us, as the data collection service we are using ("Surveymonkey.com") records your answers as soon as you submit them. If you contact us and indicate that you want your child's responses withdrawn, we will erase them from the record. Discontinuation will not affect your child's grades or standing at school.

If you allow your child to participate, he/she is free to skip any items on the questionnaire that he/she does not feel comfortable answering. The computerized data file will NOT contain any personal identifiers (i.e., names or phone numbers) other than the meaningless ID number that we assign at the start of the study. In the data file, your child's responses will be anonymous.

The company whose service is used to collect your data, "SurveyMonkey.com" has a strict privacy policy. In addition, they have been certified by SafeHarbor with respect to data protection procedures. Only researchers and assistants associated with the project will have access to the data. A list linking your child's name with the meaningless ID number will be kept in a locked room. Confidentiality will be maintained. The results of this study may be presented at scholarly conferences, published in professional journals, or presented in class lectures. Only grouped (aggregate) data will be presented. The data will be securely stored by Dr. Galambos for a minimum of five years or until the data are destroyed.

Your child's answers to the questions are private and confidential to the extent permissible by law. His or her answers will not be revealed to you nor to your child's teachers or other guardians unless Ms. Dalton or Dr. Galambos are required by law to disclose this information.

BENEFITS AND RISKS

This research can potentially contribute to our understanding of how adolescent sexual behaviour develops, and how to determine which youth are at high vs. low risk for negative consequences associated with sexual behaviour. There are no foreseeable risks to this study. Previous research has shown that exposing children and adolescents to questions about sexuality does not lead to distress and does not encourage children and adolescents to engage in sexual behaviour. If any unforeseeable risks should arise, the researcher will inform parents and participants immediately. If your child experiences any adverse effects, please contact us immediately.

CONTACT INFORMATION

If you have any questions or comments about the study, or if you wish a clarification of your child's rights as a research participant, you can contact Andrea, Dr. Galambos, or the Research Ethics Board at the numbers and addresses below:

Nancy Galambos, Ph.D.
Department of Psychology
University of Alberta
Edmonton, AB T6G 2E9
(780) 492-4607
galambos@ualberta.ca

Andrea Dalton, M.A. (Graduate Student)
Department of Psychology
University of Alberta
Edmonton, AB T6G 2E9
(780) 492-7447
andrea.dalton@ualberta.ca

Chair
Arts, Science, & Law Research Ethics Board
Department of Psychology, University of Alberta
Edmonton, AB T6G 2E9
(780) 492-4224
aslrebadministrator@ualberta.ca

My child's name (PLEASE PRINT)

☐ **YES** *I agree to allow my child to participate in this study.*

Please sign below to indicate that you have read and understood the nature and purpose of the study. Your signature acknowledges the receipt of a copy of the consent form as well as indicates your willingness to allow your child to participate in this study.

Name of parent/guardian (PLEASE PRINT)

Signature of parent/guardian Date

☐ **NO** *I do not agree to allow my child to participate in this study.*
(SIGNATURE NOT REQUIRED)

One-Class Model Command Syntax

```
VARIABLE:   NAMES = ID sex grade age timing pedu pbehav ppsych
psupport fr_sex fr_int subj_age problems psymat dec08sex febsex
aprsex junsex augsex octsex dec09sex;
            USEVAR = dec08sex febsex aprsex junsex augsex octsex
            dec09sex sex age timing problems psymat fr_sex fr_int
            pbehav;
            MISSING = ALL (999);
            CENTERING = GRANDMEAN (age timing problems psymat
fr_sex
            fr_int pbehav);
            CLASSES = c (1);

ANALYSIS:   TYPE = MIXTURE;
            PROCESSORS = 2;
            STARTS = 10000 20;

MODEL:  %overall%
        i s | dec08sex@-1 febsex@0 aprsex@1 junsex@2 augsex@3
octsex@4
        dec09sex@5;
            i@0;
            s@0;

        dec08sex (1);
        febsex (1);
        aprsex (1);
        junsex (1);
        augsex (1);
        octsex (1);
        dec09sex (1);

        %c#1%
        i s ON sex age timing problems psymat fr_sex fr_int
pbehav;

OUTPUT: standardized;

PLOT:   type = plot3;
        series = dec08sex (-1) febsex (0) aprsex (1) junsex (2)
augsex
        (3) octsex (4) dec09sex (5);
```

Two-Class Model Command Syntax

```
VARIABLE:   NAMES = ID sex grade age timing pedu pbehav ppsych
psupport fr_sex fr_int subj_age problems psymat dec08sex febsex
aprsex junsex augsex octsex dec09sex;
            USEVAR = dec08sex febsex aprsex junsex augsex octsex
            dec09sex sex age timing problems psymat fr_sex fr_int
            pbehav;
            MISSING = ALL (999);
            CENTERING = GRANDMEAN (age timing problems psymat
fr_sex
```

```
            fr_int pbehav);
            CLASSES = c (2);

ANALYSIS:   TYPE = MIXTURE;
            PROCESSORS = 2;
            STARTS = 10000 20;

MODEL:  %overall%
        i s | dec08sex@-1 febsex@0 aprsex@1 junsex@2 augsex@3
octsex@4
        dec09sex@5;
            i@0;
            s@0;

        dec08sex (1);
        febsex (1);
        aprsex (1);
        junsex (1);
        augsex (1);
        octsex (1);
        dec09sex (1);

        c#1 ON sex age timing problems psymat fr_sex fr_int
pbehav;

        %c#1%
        i s ON sex age timing problems psymat fr_sex fr_int
pbehav;

        %c#2%
        i s ON sex age timing problems psymat fr_sex fr_int
pbehav;

OUTPUT: standardized;

PLOT:   type = plot3;
        series = dec08sex (-1) febsex (0) aprsex (1) junsex (2)
augsex
        (3) octsex (4) dec09sex (5);
```

Three-Class Model Command Syntax

```
VARIABLE:   NAMES = ID sex grade age timing pedu pbehav ppsych
psupport fr_sex fr_int subj_age problems psymat dec08sex febsex
aprsex junsex augsex octsex dec09sex;
            USEVAR = dec08sex febsex aprsex junsex augsex octsex
            dec09sex sex age timing problems psymat fr_sex fr_int
            pbehav;
            MISSING = ALL (999);
            CENTERING = GRANDMEAN (age timing problems psymat
fr_sex
            fr_int pbehav);
            CLASSES = c (3);

ANALYSIS:   TYPE = MIXTURE;
            PROCESSORS = 2;
            STARTS = 10000 20;
```

```
MODEL:  %overall%
        i s | dec08sex@-1 febsex@0 aprsex@1 junsex@2 augsex@3
octsex@4
        dec09sex@5;
            i@0;
            s@0;

        dec08sex (1);
        febsex (1);
        aprsex (1);
        junsex (1);
        augsex (1);
        octsex (1);
        dec09sex (1);

        c#1 ON sex age timing problems psymat fr_sex fr_int
pbehav;
        c#2 ON sex age timing problems psymat fr_sex fr_int
pbehav;

        %c#1%
        i s ON sex age timing problems psymat fr_sex fr_int
pbehav;

        %c#2%
        i s ON sex age timing problems psymat fr_sex fr_int
pbehav;

        %c#3%
        i s ON sex age timing problems psymat fr_sex fr_int
pbehav;

OUTPUT: standardized;

PLOT:   type = plot3;
        series = dec08sex (-1) febsex (0) aprsex (1) junsex (2)
augsex
        (3) octsex (4) dec09sex (5);
```

Three-Class Model Output

TESTS OF MODEL FIT

Loglikelihood

H0 Value	-798.014
H0 Scaling Correction Factor for MLR	0.758

Information Criteria

Number of Free Parameters	73
Akaike (AIC)	1742.028
Bayesian (BIC)	1922.874
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	1692.516

FINAL CLASS COUNTS AND PROPORTIONS FOR THE LATENT CLASSES BASED ON THE ESTIMATED MODEL

Latent Classes		
1	40.67850	0.46226
2	26.24760	0.29827
3	21.07390	0.23948

CLASSIFICATION QUALITY

Entropy	0.954

CLASSIFICATION OF INDIVIDUALS BASED ON THEIR MOST LIKELY LATENT CLASS MEMBERSHIP

Class Counts and Proportions

Latent Classes		
1	41	0.46591
2	26	0.29545
3	21	0.23864

Average Latent Class Probabilities for Most Likely Latent Class Membership (Row)
by Latent Class (Column)

	1	2	3
1	0.978	0.020	0.002
2	0.014	0.975	0.011
3	0.010	0.003	0.987

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Latent Class 1				
I |				
DEC08SEX	1.000	0.000	999.000	999.000
FEBSEX	1.000	0.000	999.000	999.000
APRSEX	1.000	0.000	999.000	999.000
JUNSEX	1.000	0.000	999.000	999.000
AUGSEX	1.000	0.000	999.000	999.000
OCTSEX	1.000	0.000	999.000	999.000
DEC09SEX	1.000	0.000	999.000	999.000
S |				
DEC08SEX	-1.000	0.000	999.000	999.000
FEBSEX	0.000	0.000	999.000	999.000
APRSEX	1.000	0.000	999.000	999.000
JUNSEX	2.000	0.000	999.000	999.000
AUGSEX	3.000	0.000	999.000	999.000
OCTSEX	4.000	0.000	999.000	999.000
DEC09SEX	5.000	0.000	999.000	999.000
I ON				
SEX	1.274	0.412	3.092	0.002
AGE	0.390	0.171	2.272	0.023
TIMING	-0.177	0.187	-0.946	0.344
PROBLEMS	1.005	0.351	2.861	0.004
PSYMAT	-0.993	0.286	-3.466	0.001
FR_SEX	0.489	0.197	2.484	0.013
FR_INT	0.996	0.274	3.632	0.000
PBEHAV	1.161	0.381	3.045	0.002
S ON				
SEX	-0.299	0.077	-3.883	0.000
AGE	-0.084	0.044	-1.893	0.058
TIMING	0.013	0.047	0.276	0.783
PROBLEMS	0.040	0.056	0.716	0.474
PSYMAT	0.147	0.063	2.309	0.021
FR_SEX	-0.115	0.050	-2.291	0.022
FR_INT	-0.148	0.063	-2.346	0.019
PBEHAV	-0.272	0.096	-2.835	0.005
Intercepts				
DEC08SEX	0.000	0.000	999.000	999.000
FEBSEX	0.000	0.000	999.000	999.000
APRSEX	0.000	0.000	999.000	999.000
JUNSEX	0.000	0.000	999.000	999.000
AUGSEX	0.000	0.000	999.000	999.000
OCTSEX	0.000	0.000	999.000	999.000
DEC09SEX	0.000	0.000	999.000	999.000
I	1.237	0.223	5.542	0.000
S	-0.139	0.068	-2.040	0.041

Residual Variances				
DEC08SEX	1.700	0.247	6.894	0.000
FEBSEX	1.700	0.247	6.894	0.000
APRSEX	1.700	0.247	6.894	0.000
JUNSEX	1.700	0.247	6.894	0.000
AUGSEX	1.700	0.247	6.894	0.000
OCTSEX	1.700	0.247	6.894	0.000
DEC09SEX	1.700	0.247	6.894	0.000
I	0.000	0.000	999.000	999.000
S	0.000	0.000	999.000	999.000
Latent Class 2				
I BY				
DEC08SEX	1.000	0.000	999.000	999.000
FEBSEX	1.000	0.000	999.000	999.000
APRSEX	1.000	0.000	999.000	999.000
JUNSEX	1.000	0.000	999.000	999.000
AUGSEX	1.000	0.000	999.000	999.000
OCTSEX	1.000	0.000	999.000	999.000
DEC09SEX	1.000	0.000	999.000	999.000
S BY				
DEC08SEX	-1.000	0.000	999.000	999.000
FEBSEX	0.000	0.000	999.000	999.000
APRSEX	1.000	0.000	999.000	999.000
JUNSEX	2.000	0.000	999.000	999.000
AUGSEX	3.000	0.000	999.000	999.000
OCTSEX	4.000	0.000	999.000	999.000
DEC09SEX	5.000	0.000	999.000	999.000
I ON				
SEX	0.510	0.619	0.823	0.410
AGE	0.762	0.262	2.913	0.004
TIMING	-1.234	0.190	-6.500	0.000
PROBLEMS	0.878	0.721	1.218	0.223
PSYMAT	-2.791	0.374	-7.468	0.000
FR_SEX	0.888	0.270	3.286	0.001
FR_INT	-1.237	0.418	-2.957	0.003
PBEHAV	-0.993	0.439	-2.261	0.024
S ON				
SEX	0.354	0.184	1.925	0.054
AGE	0.002	0.076	0.020	0.984
TIMING	0.233	0.042	5.513	0.000
PROBLEMS	-0.130	0.205	-0.635	0.525
PSYMAT	0.386	0.137	2.816	0.005
FR_SEX	-0.118	0.077	-1.527	0.127
FR_INT	0.335	0.118	2.844	0.004
PBEHAV	-0.011	0.130	-0.088	0.930
Intercepts				
DEC08SEX	0.000	0.000	999.000	999.000
FEBSEX	0.000	0.000	999.000	999.000
APRSEX	0.000	0.000	999.000	999.000
JUNSEX	0.000	0.000	999.000	999.000
AUGSEX	0.000	0.000	999.000	999.000

OCTSEX	0.000	0.000	999.000	999.000
DEC09SEX	0.000	0.000	999.000	999.000
I	3.810	0.553	6.890	0.000
S	-0.108	0.173	-0.622	0.534
Residual Variances				
DEC08SEX	1.700	0.247	6.894	0.000
FEBSEX	1.700	0.247	6.894	0.000
APRSEX	1.700	0.247	6.894	0.000
JUNSEX	1.700	0.247	6.894	0.000
AUGSEX	1.700	0.247	6.894	0.000
OCTSEX	1.700	0.247	6.894	0.000
DEC09SEX	1.700	0.247	6.894	0.000
I	0.000	0.000	999.000	999.000
S	0.000	0.000	999.000	999.000
Latent Class 3				
I BY				
DEC08SEX	1.000	0.000	999.000	999.000
FEBSEX	1.000	0.000	999.000	999.000
APRSEX	1.000	0.000	999.000	999.000
JUNSEX	1.000	0.000	999.000	999.000
AUGSEX	1.000	0.000	999.000	999.000
OCTSEX	1.000	0.000	999.000	999.000
DEC09SEX	1.000	0.000	999.000	999.000
S BY				
DEC08SEX	-1.000	0.000	999.000	999.000
FEBSEX	0.000	0.000	999.000	999.000
APRSEX	1.000	0.000	999.000	999.000
JUNSEX	2.000	0.000	999.000	999.000
AUGSEX	3.000	0.000	999.000	999.000
OCTSEX	4.000	0.000	999.000	999.000
DEC09SEX	5.000	0.000	999.000	999.000
I ON				
SEX	-0.254	0.257	-0.989	0.322
AGE	-0.680	0.159	-4.280	0.000
TIMING	1.123	0.245	4.589	0.000
PROBLEMS	-0.785	0.957	-0.819	0.413
PSYMAT	5.233	0.314	16.663	0.000
FR_SEX	1.337	0.215	6.225	0.000
FR_INT	0.922	0.191	4.835	0.000
PBEHAV	0.134	0.219	0.614	0.539
S ON				
SEX	0.419	0.114	3.680	0.000
AGE	-0.162	0.040	-4.041	0.000
TIMING	0.089	0.089	0.997	0.319
PROBLEMS	2.027	0.280	7.242	0.000
PSYMAT	-0.329	0.112	-2.941	0.003
FR_SEX	-0.115	0.040	-2.908	0.004
FR_INT	-0.319	0.069	-4.629	0.000
PBEHAV	-0.166	0.118	-1.414	0.158
Intercepts				
DEC08SEX	0.000	0.000	999.000	999.000

FEBSEX	0.000	0.000	999.000	999.000
APRSEX	0.000	0.000	999.000	999.000
JUNSEX	0.000	0.000	999.000	999.000
AUGSEX	0.000	0.000	999.000	999.000
OCTSEX	0.000	0.000	999.000	999.000
DEC09SEX	0.000	0.000	999.000	999.000
I	2.538	0.209	12.168	0.000
S	0.735	0.085	8.645	0.000
Residual Variances				
DEC08SEX	1.700	0.247	6.894	0.000
FEBSEX	1.700	0.247	6.894	0.000
APRSEX	1.700	0.247	6.894	0.000
JUNSEX	1.700	0.247	6.894	0.000
AUGSEX	1.700	0.247	6.894	0.000
OCTSEX	1.700	0.247	6.894	0.000
DEC09SEX	1.700	0.247	6.894	0.000
I	0.000	0.000	999.000	999.000
S	0.000	0.000	999.000	999.000
Categorical Latent Variables				
C#1 ON				
SEX	-2.035	1.058	-1.923	0.055
AGE	-1.462	0.549	-2.662	0.008
TIMING	1.537	0.892	1.724	0.085
PROBLEMS	6.178	3.503	1.763	0.078
PSYMAT	-1.273	0.805	-1.581	0.114
FR_SEX	-2.428	0.742	-3.270	0.001
FR_INT	-0.631	0.524	-1.204	0.229
PBEHAV	-3.549	1.215	-2.921	0.003
C#2 ON				
SEX	0.800	0.951	0.842	0.400
AGE	-0.087	0.583	-0.150	0.881
TIMING	1.665	0.928	1.794	0.073
PROBLEMS	4.844	3.375	1.435	0.151
PSYMAT	-1.000	0.859	-1.165	0.244
FR_SEX	-0.757	0.763	-0.993	0.321
FR_INT	0.749	1.015	0.739	0.460
PBEHAV	-3.233	1.203	-2.687	0.007
Intercepts				
C#1	2.544	0.889	2.862	0.004
C#2	0.941	1.138	0.826	0.409

R-SQUARE

Class 1

Observed Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
DEC08SEX	0.486	0.091	5.320	0.000
FEBSEX	0.423	0.084	5.046	0.000
APRSEX	0.360	0.073	4.908	0.000
JUNSEX	0.303	0.062	4.856	0.000
AUGSEX	0.260	0.054	4.782	0.000

OCTSEX	0.237	0.051	4.692	0.000
DEC09SEX	0.239	0.051	4.692	0.000

Latent Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
I	1.000	999.000	999.000	999.000
S	1.000	999.000	999.000	999.000

Class 2

Observed Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
DEC08SEX	0.801	0.050	15.931	0.000
FEBSEX	0.764	0.054	14.079	0.000
APRSEX	0.720	0.057	12.704	0.000
JUNSEX	0.673	0.057	11.876	0.000
AUGSEX	0.625	0.054	11.520	0.000
OCTSEX	0.587	0.054	10.799	0.000
DEC09SEX	0.566	0.065	8.720	0.000

Latent Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
I	1.000	999.000	999.000	999.000
S	1.000	999.000	999.000	999.000

Class 3

Observed Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
DEC08SEX	0.817	0.034	24.116	0.000
FEBSEX	0.790	0.037	21.197	0.000
APRSEX	0.772	0.040	19.348	0.000
JUNSEX	0.767	0.042	18.423	0.000
AUGSEX	0.778	0.042	18.478	0.000
OCTSEX	0.801	0.041	19.714	0.000
DEC09SEX	0.829	0.037	22.250	0.000

Latent Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
I	1.000	999.000	999.000	999.000
S	1.000	999.000	999.000	999.000