



Gender differences in risk factors for cigarette smoking initiation in childhood



Marie-Pierre Sylvestre^{a,b}, Robert J. Wellman^c, Erin K. O'Loughlin^d, Erika N. Dugas^b, Jennifer O'Loughlin^{a,b,e,*}

^a University of Montréal, Montréal, QC, Canada

^b Centre de Recherche du Centre Hospitalier de l'Université de Montréal (CRCHUM), Montréal, QC, Canada

^c University of Massachusetts Medical School, Worcester, MA, USA

^d Concordia University, Canada

^e Institut National de Santé Publique du Québec, Montréal, QC, Canada

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ABSTRACT

Introduction: We investigated whether established risk factors for initiating cigarette smoking during adolescence (parents, siblings, friends smoke; home smoking rules, smokers at home, exposure to smoking in cars, academic performance, susceptibility to smoking, depressive symptoms, self-esteem, school connectedness, use of other tobacco products) are associated with initiation in preadolescents, and whether the effects of these factors differ by gender.

Methods: In spring 2005, baseline data were collected in self-report questionnaires from 1801 5th grade students including 1553 never-smokers (mean age = 10.7 years), in the longitudinal AdoQuest I Study in Montréal, Canada. Follow-up data were collected in the fall and spring of 6th grade (2005–2006). Poisson regression analyses with robust variance estimated the effects of each risk factor on initiation and additive interactions with gender were computed to assess the excess risk of each risk factor in girls compared to boys.

Results: 101 of 1399 participants in the analytic sample (6.7% of boys; 7.7% of girls) initiated smoking during follow-up. After adjustment for age, gender and maternal education, all risk factors except academic performance and school connectedness were statistically significantly associated with initiation. Paternal and sibling smoking were associated with initiation in girls only, and girls with lower self-esteem had a significant excess risk of initiating smoking in 6th grade.

Conclusions: Risk factors for smoking initiation in preadolescents mirror those in adolescents; their effects do not differ markedly by gender. Preventive programs targeting children should focus on reducing smoking in the social environment and the dangers of poly-tobacco use.

1. Introduction

Preventing cigarette smoking initiation among youth is a major public health goal, supported by the World Health Organization (World Health Organization, 1998) and governments internationally, including in the U.S. (Office of Disease Prevention and Health Promotion, 2008) and Canada (Health Canada, 2013). While most smokers begin during adolescence, some children initiate earlier. According to 2012 data, 3.4% of Canadian children in 6th grade (ages 11–12 years) had tried a cigarette (Reid, Hammond, Rynard, & Burkhalter, 2015). In the U.S. in 2015, 6.6% of 8th graders reported using cigarettes at the end of 6th grade (Miech, Johnston, O'Malley, Bachman, & Schulenberg, 2016), and

worldwide, between 2004 and 2011, estimates of smoking initiation prior to age 12 range from 3 to 27% (Chang et al., 2011; Galanti, Rosendahl, Post, & Gilljam, 2001; Milton et al., 2004; Wang, Ho, & Lam, 2011).

Initiating smoking at an earlier age is associated with numerous negative health effects including a greater likelihood of severe nicotine dependence. A one-year increase in age at initiation among 213 ever-smokers participating in the Mannheim Study of Children at Risk, was associated with smoking 33.5 fewer cigarettes per month at age 22 and a decrease of 0.42 in the Fagerström Test for Nicotine Dependence score (Buchmann et al., 2011). Animal models suggesting increased sensitivity to nicotine in early (compared to middle or late) adolescence,

Abbreviations: RERI, Relative Excess Risk due to Interaction; RR, risk ratio; ARR, adjusted risk ratio

* Corresponding author at: CRCHUM, 850 Rue Saint-Denis, Bureau S02-370, Montréal, QC H2X 0A9, Canada.

E-mail address: jennifer.oloughlin@umontreal.ca (J. O'Loughlin).

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provide a plausible explanation for higher dependence levels among younger initiators. Mice exposed to nicotine early in adolescence preferred self-administered nicotine to water, increased their rate of self-administration when the nicotine dose was reduced, and developed increased nicotine-induced hyperactivity, whereas mice exposed later in adolescence did not (Adriani, Macrì, Pacifici, & Laviola, 2002). Further, rats pretreated briefly with low doses of nicotine in early adolescence showed age-specific enhancement in both dopamine-mediated (i.e., locomotion, penile erection) and reward behaviors (i.e., self-administration of cocaine, methamphetamine and alcohol; cocaine-induced locomotor sensitization) that was not found in rats treated later (McQuown, Belluzzi, & Leslie, 2007; McQuown, Dao, Belluzzi, & Leslie, 2009).

We reviewed 53 longitudinal studies of predictors of smoking initiation (Wellman et al., 2016), five of which investigated initiation by age 12 (Galanti et al., 2001; Milton et al., 2004; Rosendahl, Galanti, Giljam, Bremberg, & Ahlbom, 2002; Wang, Ho, & Lam, 2011; Wang, Ho, Lo, & Lam, 2011). The risk factors examined included gender, parental smoking, living with a smoker or secondhand smoke exposure at home, and susceptibility to future smoking or intention to smoke in the future, each of which was investigated in two studies, plus siblings' or friends' smoking, school socioeconomic status, school anti-smoking policies and procedures, and perceived prevalence of peer smoking, each of which was investigated in one study. Two recent studies focused on conduct or internalizing problem behaviors (Aloise-Young, Zaleski, & Swaim, 2017; Temcheff, Déry, St-Pierre, Laventure, & Lemelin, 2016), and one qualitative study highlighted the importance of curiosity and peers in preadolescents' accounts of early smoking (Milton, Woods, Dugdill, Porcellato, & Springett, 2008). These findings in animals and the limited number of human studies collectively provide compelling evidence supporting the need to investigate smoking initiation in preadolescents in more depth.

The incidence of smoking initiation among youth in the U.S. differs by gender. Each year between 2008 and 2013 (except for 2009), more girls than boys ages 12–17 initiated smoking. The difference in proportions ranged from a high of 0.9% in 2008 (6.8% of girls vs. 5.8% of boys) to a low of 0.1% in 2013 (4.3% of girls vs. 4.2% of boys; Office of Disease Prevention and Health Promotion, 2013). In contrast, a systematic review of 12 studies including a total of 11,000 youth ages 8–20 in nine countries (Okoli, Greaves, & Fagyas, 2013) revealed that boys began smoking at a younger age than girls and further, that boys and girls differed in the setting in which they smoked their first cigarette (i.e., boys at school, girls at home) and in reasons they gave for smoking (i.e., the desire to look “cool” and mature for boys and curiosity and rebelliousness toward authority for girls).

Gender differences in the incidence of smoking initiation might result from differential influences of risk factors for initiation. Remarkably, only one longitudinal population-based study to date reported results stratified by gender. McKelvey et al. (2015) followed 1454 never-smokers in Jordan from 2008 (7th grade) to 2011 (10th grade). After controlling for covariates, parental and siblings' smoking increased the odds of initiating in girls, but not in boys. Friends' smoking, low refusal self-efficacy, intention to smoke in the next year, and smoking water pipe were influential in both genders.

The current study addresses the paucity of longitudinal studies investigating risk factors for initiation in children less than age 12. Additionally, although the presence of gender differences could influence the design and targets of tobacco control programs for children, even fewer longitudinal studies investigate if risk factors differ by gender. Our objectives were therefore to assess: (i) whether exposure to 13 well-established risk factors for initiation in adolescence also predicts initiation in preadolescence; and (ii) whether gender interacts with these risk factors to increase the risk of initiation. We studied these issues in a cohort of never-smokers, age 10.7 years at inception, which we followed at 6-month intervals for one year.

2. Methods

2.1. Study sample and data collection

AdoQuest 1 is a prospective study (2005–2011) that investigated the natural course of co-occurring health-compromising behaviors in children (O'Loughlin, Dugas, Sabiston, & O'Loughlin, 2012). We recruited a random sample of French-language schools with > 90 students in 5th grade in the greater Montréal area. We categorized schools into three strata defined by tertile of a family deprivation indicator (Québec Ministère de l'Éducation, 2003) that incorporates parental employment, maternal education, and a measure of low family income accounting for family size and area of residence (Da Rosa et al., 2011; Pabayo, Janoz, Bisset, & Kawachi, 2014). Within each stratum, we randomly selected an equal number of schools to assure a balance in students according to family deprivation. Ten, 10 and 9 schools in the first, second and third strata agreed to participate. We recruited students from all 5th grade classes in the 29 schools. Participants provided assent and parents/guardians provided informed consent. The study was approved by the Concordia University Human Research Ethics Committee and the Centre de Recherche du Centre Hospitalier de l'Université de Montréal Ethics Review Board.

Using methods adapted from the Canadian Youth Smoking Survey (Elton-Marshall et al., 2013), we collected baseline data in spring 2005 (5th grade) and follow-up data in fall 2005 and spring 2006 (6th grade) in classroom-administered self-report questionnaires. Parents completed mailed self-report questionnaires in 2006.

Of 2946 5th grade students, 1801 (61%) participated at baseline. No data were collected on students who did not participate. AdoQuest participants were comparable to participants in two provincially (Quebec) representative samples (Elton-Marshall et al., 2013; Paradis et al., 2003) of similarly-aged children in gender distribution, proportion that spoke French, were in two-parent families, had at least one university-educated parent, and had at least one parent who smoked. AdoQuest participants had a higher SES and a higher proportion had tried smoking.

2.2. Analytic sample

We assembled a subgroup of never-smokers from among the 1801 participants with baseline data. Sixteen participants (0.1%) missing data on smoking in 5th grade and 232 (12.9%) who had already initiated smoking were excluded from the analyses. To decrease potential misclassification in identifying never-smokers, we examined responses to other smoking-related items (i.e., number of cigarettes smoked in previous week; three-month recall of number of smoking days; usual number of cigarettes smoked per day). If smoking was reported on any item, the participant was excluded. Of 1553 never-smokers, 144 (9.3%) were missing all data in 6th grade and 10 (0.06%) were missing data on smoking, yielding an analytic sample of 1399 never-smokers. Compared to retained participants, those not retained were older; fewer spoke French as their primary language, and more had university-educated mothers and had siblings who smoked (Table 1).

2.3. Study variables

Participants were asked: “In the past six months, have you tried cigarette smoking, even just a few puffs?” (yes, no). Self-report of cigarette smoking by youth is valid and reliable (Brener, Billy, & Grady, 2003; Henriksen & Jackson, 1999; Wong, Shields, Leatherdale, Malaison, & Hammond, 2012). Cigarette smoking initiation was defined as a 5th grade never-smoker reporting yes in 6th grade.

The 13 risk factors investigated consistently predicted initiation among adolescents (Wellman et al., 2016) and included father, mother, siblings and friends smoke; no home smoking ban, number of smokers at home, number of days in the past week that the participant was

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