



Commentary

Adolescent Risk-Taking, Cancer Risk, and Life Course Approaches to Prevention

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A B S T R A C T

Adolescent risk-taking may have long-term consequences for adult cancer risk. Behaviors such as smoking and sexual activity, commonly initiated during adolescence, may result—decades later—in cancer. Life course epidemiology focuses on unique vulnerabilities at specific development periods and their importance to later development of disease. A life course epidemiological perspective that integrates social and biological risk processes can help frame our understanding how specific adult cancers develop. Moreover, life course perspectives augment traditional public health approaches to prevention by emphasizing the importance of unique windows of opportunity for prevention.

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Adolescence is characterized by exploration, experimentation, and—from the viewpoint of adults—risk-taking. When manifest as health-risk behaviors, such risk-taking can have serious short- and long-term adverse health consequences. Health-risk behaviors, which include smoking, substance abuse, aggression, and early sexual activity, also show significant clustering and covariation [1,2]. Involvement in behaviors such as smoking and sexual activity rises rapidly in early adolescence beginning about age 12 [3,4]. For example, 80% of adult smokers initiate smoking before age 18 and virtually none after age 25 [4]; similarly, 58% of young people initiate sex before 18, 77% before age 20, and more than 90% before age 25 [3]. Importantly, smoking and risky sexual behaviors such as having multiple partners frequently persist into adulthood. This adolescent period of behavior initiation is relatively universal across nations and cultural groups, even if cultural values and pressures shift the average age of initiation by a year or two [5].

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Adolescent risk behaviors are the result of a complex combination of social, genetic, and developmental factors [2,6], characterized by an underlying propensity for risk taking that involves high sensation seeking and immature self-regulation [7]. Given the covariation in adolescent risk-taking, comprehensive interventions for young people are recommended. These interventions target multiple risk behaviors by enhancing resiliency, life circumstances, and life skills rather than through programs that target risk behaviors one at a time [8,9]. It is important to note that, although health professionals often focus on the negative consequences of adolescent risk-taking, being a risk taker may also have positive consequences, particularly from the viewpoint of evolutionary survival [10]. Witness Bill Gates and Steve Jobs who, from adolescence onward challenged the status quo.

From a life course epidemiologic perspective, adolescence is a critical period in the development of health and disease processes. Life course epidemiology—still a relatively young field—is concerned with earlier precursors (risk factors) for later adverse health outcomes, outcomes whose precursors are often poorly understood initially because they occurred many years earlier [11,12]. Key concepts in life course epidemiology include critical periods of vulnerability, latency between exposure and outcome, and resiliency in the face of adverse exposures. Life course epidemiology also considers accumulation of risk

exposures over time, dose-response, clustering of exposures, and the potential for chains of risk [11].

Figure 1 places adolescence and risk of cancer within the life course epidemiological perspective of periods of exposure, latency, and disease outcomes. As the figure shows, often considerable time elapses between a carcinogenic exposure and clinical disease. For example, the latency periods between starting to smoke and lung cancer or between acquiring an oncogenic strain of human papillomavirus (HPV) infection and cancer are measured in years and decades. Exposures may also have a complex relationship with time (e.g., cumulative or progressive). They may also be multifactorial, such as the impact of smoking and socioeconomic status on adult cardiovascular disease outcomes. Furthermore, although this special issue of the *Journal of Adolescent Health* focuses on adolescent behaviors that increase risk for cancer in adulthood, from a life course perspective, adolescence is both a period of exposure to health risk factors for cancer and a period in which health outcomes from prenatal or early life exposures can manifest as cancer (e.g., the impact of in utero exposure to diethylstilbestrol on adenocarcinoma of the vagina) [13].

From a life course perspective, there are unique vulnerabilities at specific developmental periods that have dramatic importance for later health outcomes [11,12]. Vulnerability is defined by sensitive periods in which the effect of an exposure is greatly magnified. Therefore, if life course and developmental perspectives are combined, adolescence can be seen as a period of high vulnerability with multiple transformations occurring simultaneously: biological growth, development in multiple organ systems (including the brain and reproductive organs), increased receptivity to social influences beyond the family, and initiation of multiple health risk behaviors. Perhaps the most obvious vulnerability—and the one most amenable to public health interventions—is the initiation of health risk behaviors. Notably, adolescents who initiate sexual intercourse and smoking earlier than their peers also report increased involvement in risk behaviors as young adults [14,15]. Adult women reporting early initiation of smoking (earlier than their peers)

also report greater sexual risk-taking and more adverse reproductive health outcomes [15]. Initiation of tobacco use, because of its addictive qualities, often results in persistent use throughout adulthood. Moreover, use of certain gateway drugs (tobacco and alcohol) during adolescence may lead to use of other drugs such as cocaine or opiates [16]. Recent research shed light on one potential mechanism that leads adolescents from smoking to other drug use: nicotine may prime the developing adolescent brain to later use of cocaine, providing a molecular basis for the gateway hypothesis and reinforcing the importance of early adolescent vulnerability [17].

Life course perspectives on health are supported by cohort and case-control studies that are increasingly specific about period of exposure and that connect distant exposures with contemporary disease outcomes. Distal social factors, for instance, have complex and multiple implications that emerge through multiple pathways. Furthermore, life course cohorts are also affected by historical context and risk factors may operate differently over time and across societies and social groups, given differing social values and practices and changing exposures to technology. Therefore, the interaction between the period and cohort effects may have important implications for secular growth trends such as the changing age of girls at menarche. Given this complexity, when an exposure and vulnerable period are identified, further investigations of the risk factors for the exposure and strategies to prevent exposure within a critical period are often warranted.

From a public health perspective, periods of exposure and vulnerability are critical because they are windows of opportunity to prevent disease. However, our review of the life course epidemiology literature suggested that the vulnerability of adolescents has been relatively unexamined compared with the vulnerabilities in utero and during early childhood. We have perhaps only scratched the surface in identifying exposures during adolescence that are important to cancer and other health outcomes.

This special issue of the *Journal of Adolescent Health* on opportunities for cancer prevention during pre-adolescence and adolescence reviews research on health-risk behaviors (e.g.,

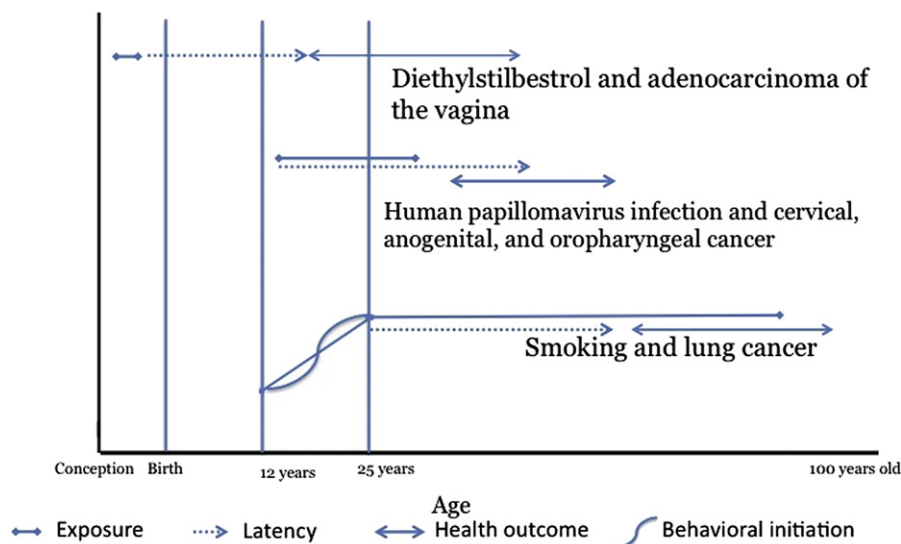


Figure 1. Adolescence and cancer risk from a life course perspective.

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