

Genes and the environment interact to influence adolescent alcohol use

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Adolescent alcohol use and behavior problems are influenced by a combination of genetic and environmental factors. A new study has found that socio-regional factors moderate the importance of genetic influences on early adolescent behavior problems in a way that parallels moderating effects observed for alcohol use later in adolescence.

Results will be published in the October issue of *Alcoholism: Clinical & Experimental Research* and are currently available at Early View.

"In the past, research on genetic and environmental influences on behavior was often conducted in isolation," explained Danielle Dick, assistant professor of psychiatry, psychology, and human and molecular genetics at Virginia Commonwealth University. "Some scientists were interested in genetic effects, others in environmental effects. We now know that both genetic and environmental influences are important for most behavioral outcomes and our challenge is to understand how they interact."

"This paper adds to a growing and very promising area of research showing that child and adolescent behavioral problems emerge from an interplay of inherited vulnerabilities and life experiences," noted Lisa Legrand, research psychologist at the University of Minnesota. "While inherited factors may place an individual at increased risk, psychosocial or environmental exposures may either aggravate or protect against this risk. Moreover, certain environments may actually modify gene expression such that the influence of genes varies by circumstances."

"Much of the research on environmental influences on [alcohol](#) use and behavior problems focuses on the impact of parents and peers," added Dick. "While these are clearly critical environmental influences, we have also found that socio-regional, or neighborhood influences, also have big impacts on [adolescent](#) behavioral outcomes, and these environmental effects have not received as much attention historically."

Researchers used data from FinnTwin12, a population-based study of health-related behaviors and correlated risk factors that has followed more than 5,000 twins identified in Finland's Population Registry Center as having been born in the years 1983 through to 1987. Drawing from previous findings that community-level factors such as urban/rural residency, migration rates, and prevalence of young adults can moderate the importance of genetic effects on alcohol use among 16- to 18-year olds, this study looked at their influence on behavior problems at 12 and alcohol use at 14 years of age.

"One of the key reasons this study is important is that it contributes to the growing body of literature showing that environmental influences play an important role in the expression of an individual's genetic predispositions," said Dick. "In this case, how important genetic influences are on behavior problems in young girls can vary quite a bit as a function of neighborhoods factors."

Certain environments appeared to encourage gene expression while others constrained it, observed Legrand. "The environments that produced higher heritability estimates for female behavioral problems were urban, had a relatively mobile population, and were marked by a higher percentage of older adolescents," she said. "Conversely in rural, stable, and low-adolescent settings, preadolescent behavior problems appeared to be more influenced by the rearing environment."

It could be that girls are more susceptible than boys to certain

environmental influences, Legrand added. "For example, rural females may remain closer to their parents and under the influence of their monitoring and control for a longer time than rural males," she said. "This is an intriguing area for future research."

"There is now converging evidence across a number of different studies that behavioral problems in kids are associated with both concurrent and future alcohol problems," said Dick. "There is evidence accumulating from genetic studies that behavior problems may be one of the first signs of an individual at increased susceptibility for developing alcohol problems."

Taken together, she cautioned, a key message from this kind of research is that genes are not destiny. "We're not all equally predisposed to develop alcohol or [behavior problems](#)," she said, "and the environment can be a key factor in whether or not an individual ever develops problems."

Legrand concurred. "This research offers added evidence that certain environmental factors can modify genetic effects," she said. "Regardless of an individual's genetic endowment, Dick's findings suggest that there are social or [environmental factors](#) that can tip the scales and either encourage or inhibit the expression of a genetic predisposition. Thus, her results serve as a reminder that the heritability statistic is always situation specific and that even highly heritable traits can be environmentally influenced."

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