

# Estimating Relative Risk of Disease from Genetic and Environmental Risk Factors

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## Abstract

The identification of genetic variants that are associated with common, complex disorders has raised the prospect that screening may identify individuals at elevated risk for these diseases when both genetic and environmental (or clinical) risk factors are measured. We develop models for estimating relative risk, combining risks from genetic and environmental factors, and provide confidence intervals around the estimated relative risk. We use our models to calculate population distributions of relative risk of disease across a wide range of parameter values for both genetic and environmental risk factors. We show that little prediction is achieved for the genetic factors typically detected through genome-wide association studies (modest relative risks  $<1.5$ ). Confidence intervals around estimated relative risks are broad, with only small proportions of the population having risk significantly above an average member of the population. Analysis of complex disorders indicates only limited utility of risk estimation based on genetic and environmental risk factors, and wide variability in risk estimates.

*Keywords:* Genetics; Environment risk; Estimation; Confidence intervals.

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