**Supplementary Method**

**Confidence intervals (CIs) for genetic risk equivalent (GRE)**

GRE equals to the ratio of b1 and b2, the estimated coefficients for smoking behaviors and PRS. Thus, the properties of GRE follow from the corresponding properties of b1 and b2, which include consistency, asymptotic unbiasedness and normality. Using the delta methoda, the asymptotic variance of GRE can be derived as:

$$var\left(GRE\right)=\frac{1}{b\_{2}^{2}}\left[var\left(b\_{1}\right)-2.\left(\frac{b\_{1}}{b\_{2}}\right).cov\left(b\_{1},b\_{2}\right)+\left(\frac{b\_{1}}{b\_{2}}\right)^{2}.var\left(b\_{2}\right)\right]$$

As the GRE is asymptotically normal, its 95% CIs can be easily calculated using the square root of var(GRE) and sample size (n):

$$GRE\pm 1.96\sqrt{\frac{var(GRE)}{n}}$$

a**Bishop** YMM, **Fienberg** SE,**Holland** PW. Discrete Multivariate Analysis: Theory and Practice. Cambridge, MA; MIT press, 1975.