

marginalRisk Package Vignette

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1 Computing marginal risk using the marginal.risk function

To plot the disease risk as a function of a marker (Gilbert et al., 2021), we use the following formula:

$$\begin{aligned} & \Pr(Y = 1|s) \\ &= \int \Pr(Y = 1|s, z) f(z|s) dz \\ &= \int \Pr(Y = 1|s, z) \frac{f(s|z) f(z)}{f(s)} dz \\ &= \int \Pr(Y = 1|s, z) \frac{f(s|z) f(z)}{\int f(s|z) f(z) dz} dz \\ &= \frac{\sum_i \Pr(Y = 1|s, z_i) f(s|z_i)}{\sum_i f(s|z_i)} \end{aligned}$$

where $f(s|z)$, the density of s conditional on z , can be estimated by a fitting a linear regression model of s on z using the data.

If the data is collected according to a two phase sampling design and z_i has an inversion probability sampling weight w_i , then the formula can be updated to:

$$\Pr(Y = 1|s) = \frac{\sum_i w_i \Pr(Y = 1|s, z_i) f(s|z_i)}{\sum_i w_i f(s|z_i)},$$

and the estimation of the conditional distribution $f(s|z)$ can also include the weights to improve efficiency.

For more info on how to use the function, its help page has an example.

$$P(T \leq t | S \geq s, W) = \frac{\int_s^{\text{inf}} P(T \leq t, S = s | W)}{P(S \geq s | W)},$$

References

Gilbert, P., Fong, Y., Benkeser, D., Andriesen, J., Borate, B., Carone, M. et al (2021), *CoVPN COVID-19 Vaccine Efficacy Trial Immune Correlates SAP*.