Function `additive_interactions`

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Description

Computes measures of additive interaction for a binary outcome and binary exposures (with inference) and conducts tests for mechanistic interaction.

Call

```
additive_interactions(model, dat=NULL, monotone=0, CI.level=0.95, recode=FALSE)
```

Arguments

- `model`: A logistic regression object returned by `glm`; formula should be `outcome` ~ `exposure1 * exposure2 + covariates` (covariates optional). The coefficients will be treated as log odds ratios, so if model was fit to case-control data, then outcome must be rare.
- `dat`: A dataframe on which `model` was fit. Required only if the exposures require recoding (see Details).
- `monotone`: 0, 1, or 2 (default 0) for the number of exposures assumed to have positive monotonic effect (affects inference for epistatic and sufficient-cause interactions)
- `CI.level`: Confidence level for confidence intervals. Defaults to 0.95.
- `recode`: Should exposures automatically be recoded if one or both is negatively associated with the outcome?

Details

- In `model`, the two exposures of interest must be listed first in the linear predictor (before any covariates).
- All variables can be coded as 1/0 or as factors. Exposures must be binary.
- P-values for mechanistic interactions inherit their alpha levels from `CI.level`.
- Confidence interval bounds that are outside the "reasonable" range (e.g., < 0 for the attributable proportion) are not a cause for alarm. This is a common property of delta method confidence intervals. Occasionally, sampling error or cases in which the direction of the interaction counteracts those of the exposures can also result in point estimates with such values (e.g., AP < 0). See Knol & VanderWeele (2011) for details.
- If $RR_{10} < 1$ or $RR_{01} < 1$ and `recode==TRUE`, then the function will recode one or both exposures against new reference levels, defined based on the joint category with the lowest overall risk (Knol & VanderWeele (2011)).

Values

Returns a dataframe containing the following point estimates, CI bounds, and 1-sided p-values:

- `RERI`: relative excess risk due to interaction
- `AP`: attributable proportion (proportion of outcome under double exposure that is due to interaction)
- `CI.lo`: lower bound of 100 × `CI.level` confidence interval based on delta method
- `CI.hi`: upper bound of 100 × `CI.level` confidence interval based on delta method
- `AP`: attributable proportion (proportion of outcome under double exposure that is due to interaction)
- `p.val.0` = hypothesis test vs. 0
- `p.val.epi`: hypothesis test for presence of epistatic interaction
- `p.val.suff.cause`: hypothesis test for presence of sufficient-cause interaction
- `[name of exposure 1]`: proportion of effect under double exposure that is due to exposure 1
- `[name of exposure 2]`: proportion of effect under double exposure that is due to exposure 2
- `[name of interaction]`: proportion of effect under double exposure that is due to interaction

References

Knol, M. J., & VanderWeele, T. J. (2011). Recoding preventive exposures to get valid measures of interaction on an additive scale. *European Journal of Epidemiology*, *26*(10), 825–826.