Supplemental materials

Estimated annual percentage changes (EAPC) is a measure of the ASR trend over a time interval, calculated as the method proposed by Hankey. The age-standardised rate (ASR) could be fitted in a regression model:

$$\ln(ASR) = \alpha + \beta x + \varepsilon.$$

where α is the intercept term, β is the annual change per 100,000 in the rates, x is the calendar year, ε is the error term.

EAPC is calculated as $100\times(\exp(\beta) - 1)$, and its 95% confidence interval (CI) can also be computed similarly from the linear regression model.

For example, if we want to calculate the EAPC of prevalence of global AF/AFL from 1990 to 2017, we can get the following raw data from GBD 2017. The name of the data frame in R is data:

measure_name	location_name	sex_name	cause_name	metric_name	year	ASR
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	1990	507.3233189
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	1994	499.4232023
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	1998	493.2582504
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2002	489.3763761
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2006	487.7023255
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2010	486.2168861
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2014	483.5037373
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	1993	501.3069835
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	1997	494.6499164
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2001	489.8149858
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2005	488.310046
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2009	486.6468458
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2013	484.246483
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2017	481.5402806
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	1992	503.2165201
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	1996	496.1509016
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2000	490.6677486
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2004	488.7743747
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2008	487.0584908
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2012	484.864877
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2016	482.2168474

Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	1991	505.2268778
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	1995	497.7465089
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	1999	491.8607856
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2003	489.1214041
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2007	487.3211923
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2011	485.5297641
Prevalence	Global	Both	Atrial fibrillation and flutter	Rate	2015	482.9377298

The R code are like following:

```
######################
# First, fit a linear model to the year (from 1990 to 2017) and log(ASR):
fit_model <- glm(log(ASR)~ year, family = gaussian, data)
# Then we get β parameter of the fitted model:
coef <-    coefficients(fit_model)[2]
# And get the Confidence Intervals parameter:
lower25 <-    confint(fit_model)[2]
upper975 <-    confint(fit_model)[4]
# Thus, EAPC and its lower and upper boundary of 95% CI can be computed by:
eapc_mean <- (exp(coef) - 1)*100
eapc_lower <- (exp(lower25) - 1)*100
eapc_upper <- (exp(upper975) - 1)*100
# using paste0 to combine the result
EAPC <- paste0(round(eapc_mean,2),' (',round(eapc_lower,2),' to ',round(eapc_upper,2),')')
######################
```

Reference:

Hankey, B.F., Ries, L.A., Kosary, C.L., Feuer, E.J., Merrill, R.M., Clegg, L.X., Edwards, B.K., 2000. Partitioning linear trends in age-adjusted rates. Cancer Cause Control 11, 31-35.