Association of attrition with mortality: findings from 11 waves over three decades of the Whitehall II study

Background

Attrition, which is loss of participants as a study progresses, is a considerable methodological challenge in longitudinal studies. This current study examined whether two forms of attrition; 'withdrawal' and 'non-response' have different associations with mortality, and whether the associations differed across time in multi-wave cohort studies.

Methods

Participants were 10 012 civil servants who participated at the baseline of Whitehall II cohort study, which has 11 waves every three years with average follow-up of 28 years. We performed competing-risks analyses to estimate Sub-distribution hazard ratios and 95% Confidence Intervals of the associations between response status (response, withdrawal, non-response) and cardiovascular and non-cardiovascular mortality. Likelihood ratio test was used to investigate whether the hazards of two types of attrition differed from each other. We then examined whether the hazards of mortality differed across waves by applying linear regression. The mortality was tracked by the National Health Services central registry from baseline to August 2017.

Results

On average, 58% of attrition at each wave was due to non-response rather than withdrawal. There were 495 deaths recorded from cardiovascular disease and 1367 deaths from other causes. Study participants lost due to attrition had 1.55 (95% confidence interval 1.26 to 1.89) times higher hazard of cardiovascular mortality, and 1.56 (1.39 to 1.76) times higher hazard of non-cardiovascular mortality compared to responders after adjustment for sex, age, ethnicity, marital status, employment grade, smoking habit, alcohol drinking, and physical activity. There was no significant difference across the two forms of attrition; withdrawal and non-response in either hazards of cardiovascular mortality (p-value = 0.284), or hazards of non-cardiovascular mortality (p-value = 0.377). There was no linear trend in hazards over the 11 waves (cardiovascular mortality p=0.111, non-cardiovascular p=0.611).

Conclusion

To minimise the possible selection bias, researchers should examine whether exposures and outcomes independently cause a non-participation, and if so, it is recommendable to use statistical approach such as multiple imputation or inverse probability weighting for attrition in longitudinal studies.