The association between adherence to lifestyle recommendations and risk of colorectal cancer was investigated using a prospective cohort study. Adherence to lifestyle recommendations was measured by a lifestyle index based on five factors—physical activity, waist circumference, smoking, alcohol intake, and diet.1

Between 1993 and 1997, all Danish men and women aged 50–64 years who lived in Copenhagen and Aarhus were invited to participate. In total, 160 725 potential participants were identified and 57 053 (35%) accepted the invitation. Of the respondents, 569 were excluded because they had recently been diagnosed with cancer. A further 997 respondents were excluded because of missing data, resulting in a cohort size of 55 487. Adherence to lifestyle recommendations was measured at recruitment. Cohort participants were followed for a median of 9.9 years and the date of diagnosis of any cancer (except non-melanoma skin cancer) was recorded. The researchers concluded that adherence to recommendations for lifestyle factors may considerably reduce the risk of colorectal cancer.

Which of the following, if any, might the above cohort study have been prone to?

a) Allocation bias
b) Healthy entrant effect
c) Non-response bias
d) Selection bias

Answers

Answers b, c, and d are true, whereas a is false.

Selection bias is a general term used to describe a group of biases and effects that result in sample members not being representative of the population from which they were selected and to which the study results will be applied. Because only about a third (55 487 of 160 725; 35%) of potential participants volunteered and were included in the cohort, this could have resulted in selection bias (d is true) and non-response bias (c is true). Sample members may not be representative of the population in their sociodemographic characteristics, behaviour, or attitudes. Non-response bias is a type of selection bias that would have occurred if those that did not accept the invitation were different from those who did. Any such differences are difficult to quantify because limited information, if any, is typically available for those who do not respond. Selection bias would have been a problem only if the association between adherence to recommendations for lifestyle factors and risk of colorectal cancer risk differed between the cohort and the population.

People who have the disease of interest, or symptoms indicative of the start of the disease, are often excluded from cohorts at recruitment. One per cent (569 of 57 053) of respondents who accepted the invitation were excluded because they had recently been diagnosed with cancer. The fact that cohort members had no diagnosis of cancer at recruitment will have led to the healthy entrant effect (b is true), which is typically considered a type of selection bias. Rates of morbidity and mortality—in particular cancer—will have been lower in the initial stages of follow-up. By excluding people with cancer at recruitment, it was possible to establish if adherence to lifestyle factors preceded the onset of cancer, thereby allowing a possible causative effect to be investigated. However, cohort members may have varied their adherence to lifestyle factors during follow-up, making the investigation of any such associations difficult.

Allocation bias—the systematic difference between participants in how they are allocated to treatment—is of particular concern in clinical trials. Allocation bias can lead to confounding—systematic differences between treatment groups at baseline. Allocation bias and confounding have been described in a previous question.2 Participants were not allocated to treatment groups in the above cohort (a is false). The study was observational by design, with adherence to lifestyle factors measured at baseline and occurrence of cancer recorded during follow-up.

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1 Kirkegaard H, Johnsen NF, Christensen JF, Frederiksen K, Overvad K, Tjønneland A. Association of adherence to lifestyle recommendations and risk of colorectal cancer: a prospective Danish cohort study. BMJ 2010;341:c5504.


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Philip Sedgwick

Senior lecturer in medical statistics

Centre for Medical and Healthcare Education, St George’s, University of London, Tooting, London, UK

p.sedgwick@sgul.ac.uk