

Index of examples

Chapter 1. The role of epidemiology in cancer hazard identification by the *IARC Monographs* programme



- [**Example 1.1.**](#) Evaluation of radiofrequency electromagnetic field (RF-EMF) radiation by the *IARC Monographs* 13



- [**Example 1.2.**](#) Evaluation of red meat consumption by the *IARC Monographs* 14



- [**Example 1.3.**](#) Evaluation of night shift work by the *IARC Monographs* 14



- [**Example 1.4.**](#) Evaluation of opium consumption by the *IARC Monographs* 15

Chapter 2. Causal diagrams to evaluate sources of bias



- [**Example 2.1a.**](#) Motivation for creating a DAG for red meat consumption 26



- [**Example 2.1b.**](#) Motivation for creating a DAG for red meat consumption (continued) 29



- [**Example 2.2.**](#) Chains, forks, and colliders used in DAGs 30

	Example 2.3a.	Forks as depictions of shared causes in DAGs.....	32
	Example 2.3b.	Conditioning or blocking of paths in DAGs.....	32
	Example 2.4.	Depiction of colliders in DAGs.....	33
	Example 2.5.	Example of a collider in a randomized controlled trial among downhill skiers.....	35
	Example 2.6a.	A possible DAG for red meat consumption and colorectal cancer	37
	Example 2.6b.	Backdoor paths in a DAG for red meat consumption and colorectal cancer	38
	Example 2.6c.	Conditioning to block backdoor paths in a DAG	40
	Example 2.7a.	Depicting shared causes in a DAG for opium consumption and lung cancer	41
	Example 2.7b.	Simplifying a DAG for opium consumption and lung cancer to account for confounding ..	42
	Example 2.7c.	Confounding by backdoor paths in the DAG for opium consumption and lung cancer.....	43
	Example 2.8a.	Depiction of non-differential measurement error in a DAG for red meat consumption and colorectal cancer	47
	Example 2.8b.	Depiction of differential measurement error in a DAG for red meat consumption and colorectal cancer.....	48
	Example 2.9.	Depiction of collider bias (by hospitalization)	51
	Example 2.10.	Selection bias in a DAG of opium consumption and lung cancer	52
	Example 2.11.	Depiction of collider bias (from loss to follow-up).....	53
	Example 2.12a.	Depiction of signed DAGs.....	55
	Example 2.12b.	Using signed DAGs to determine the possible impact of biases.....	56

Chapter 3. Confounding: a routine concern in the interpretation of epidemiological studies



[Example 3.1.](#) Self-matching to control for confounding 69

[Example 3.2.](#) An example of a natural experiment to control for confounding: a military conscription lottery..... 70



[Example 3.3.](#) Adjustment for body mass index in studies on red meat consumption and colorectal cancer..... 71



[Example 3.4.](#) Overadjustment as a concern in studies on shift work and cancer..... 72



[Example 3.5.](#) Examining confounding by co-exposures in the workplace 73



[Example 3.6.](#) Healthy worker survivor bias 74



[Example 3.7.](#) Relative importance of confounders 75



[Example 3.8.](#) Negative control outcomes..... 76

[Example 3.9.](#) Indirect adjustment of SMRs to reduce healthy worker biases in aluminium smelting work..... 77

[Example 3.10.](#) Negative control exposures..... 78

[Example 3.11.](#) Using a proxy variable to evaluate confounding in a cohort of Seventh Day Adventist adherents..... 79



[Example 3.12.](#) Restriction to one level of a proxy variable to examine residual confounding 79



[Example 3.13.](#) Evidence triangulation to evaluate confounding..... 80



[Example 3.14.](#) Use of bounding to examine confounding scenarios 81



[Example 3.15.](#) Bias adjustment to evaluate confounding..... 82



[Example 3.16.](#) The *E*-value to evaluate confounding..... 83

Chapter 4. Information bias: misclassification and mismeasurement of exposure and outcome

[Example 4.1.](#) Linear models for measurement error of protein intake from food frequency questionnaires 92

[Example 4.2.](#) Berkson error in an example from blood lead and intelligence quotient testing 92

[Example 4.3.](#) Non-differential exposure misclassification when exposure is rare versus when exposure is common 93

[Example 4.4.](#) Misclassification from categorizing a continuous exposure variable in workers exposed to crystalline silica 93

[Example 4.5.](#) Assessing for varying quality of the interviewee response in assessing tobacco smoking 94



[Example 4.6.](#) Assessing for varying quality of interviewer in assessing job histories..... 94



[Example 4.7.](#) Recall bias and knowledge of carcinogenicity 95



[Example 4.8.](#) Estimation of the extent of recall bias 95



[Example 4.9.](#) Proxy respondents and recall bias in a study of pesticide exposure 96



[Example 4.10.](#) Using DAGs to identify recall bias 97



[Example 4.11.](#) Negative control exposures to assess recall bias in a study of pesticide exposure 98



[Example 4.12.](#) Positive control outcomes to assess exposure misclassification in a study of benzene exposure 98



[Example 4.13.](#) Using national statistics to assess recall bias 99

	Example 4.14.	Recruiting different types of control groups to assess recall bias.....	99
	Example 4.15.	Using triangulation to assess recall bias.....	100
	Example 4.16.	Analysis of bias from non-differential exposure misclassification.....	101
	Example 4.17.	Analysis of bias from differential exposure misclassification	102
	Example 4.18.	Multidimensional sensitivity analysis.....	103
	Example 4.19.	Sensitivity analysis for both confounding and misclassification.....	104
	Example 4.20.	Sensitivity analysis for categorical exposure misclassification	105
	Example 4.21.	Probabilistic bias analysis for exposure misclassification.....	106
	Example 4.22a.	Regression calibration for adjustment for measurement error.....	108
	Example 4.22b.	Regression calibration for adjustment for measurement error (continued).....	108
	Example 4.22c.	Regression calibration for adjustment for measurement error (continued).....	108
	Example 4.22d.	Regression calibration for adjustment for measurement error (continued).....	108
	Example 4.22e.	Estimating an adjusted confidence interval with regression calibration.....	108
	Example 4.23.	Bias adjustment for misclassified categorical exposures.....	110



[**Example 4.24.**](#) Bayesian model components for non-differential exposure misclassification in a case–control study 113

[**Example 4.25.**](#) Opium use and HNSCC – bias analysis for categorical data..... 114

[**Example 4.26.**](#) Non-differential outcome misclassification in studies of low-dose ionizing radiation 115



[**Example 4.27.**](#) Non-differential outcome misclassification from underdiagnosis of prostate cancer..... 115

[**Example 4.28.**](#) Non-differential outcome misclassification of tumour subtypes..... 116



[**Example 4.29.**](#) Differential outcome misclassification among firefighters 116

[**Example 4.30.**](#) Sensitivity analysis for outcome misclassification..... 116

Chapter 5. Selection bias and other miscellaneous biases



[**Example 5.1.**](#) Selection bias in a case–control study..... 126



[**Example 5.2.**](#) Magnitude of selection bias..... 127



[**Example 5.3.**](#) Assessing bias due to non-response at baseline in an occupational cohort study of flight attendants..... 128



[**Example 5.4.**](#) Bias due to loss to follow-up in an occupational cohort study of flight attendants..... 129



[**Example 5.5.**](#) Identifying time zero in an occupational cohort study of flight attendants 130



[**Example 5.6.**](#) Left truncation as a source of selection bias in studies of hormone replacement therapy..... 130



[**Example 5.7.**](#) Left truncation in a population-based cohort study of breast cancer..... 131

[**Example 5.8.**](#) Right truncation in the cohort of atomic bomb survivors in Japan 132

	Example 5.9.	Cross-validation to improve ascertainment of case participants	133
	Example 5.10.	Potential bias resulting from differential selection of case participants	134
	Example 5.11.	Potential bias from incomplete case ascertainment of benign tumours.....	134
	Example 5.12.	Potential selection bias arising from different sources of case ascertainment	135
	Example 5.13.	Potential bias from excluding people with previous cancer from the study.....	135
	Example 5.14.	Potential bias arising from inclusion of prevalent cases	136
	Example 5.15.	Indirect evaluation of potential selection bias from differential participation rates in a case–control study	136
	Example 5.16.	Evaluating potential Berkson bias in a case–control study.....	137
	Example 5.17.	Evaluating potential selection bias from recruitment of hospital-based control participants	137
	Example 5.18.	Recruiting hospital visitors as control participants.....	138
	Example 5.19.	Triangulation across control groups in a study of titanium dioxide exposure.....	138
	Example 5.20a.	Potential bias from non-participation in a population-based case–control study	139
	Example 5.20b.	Demographic variables as surrogates for examining selection bias	140
	Example 5.20c.	Use of short questionnaires among non-respondents in a case–control study	140



[**Example 5.20d.**](#) Examining the potential for bias from use of proxy interviews 140



[**Example 5.21.**](#) Potential selection bias from differential participation in a case–control study 141



[**Example 5.22.**](#) Potential bias from recruitment of hospital-based control groups 141



[**Example 5.23.**](#) Using negative control exposures to examine potential selection bias in a case–control study 142



[**Example 5.24.**](#) Using negative control outcomes to examine potential selection bias in a case–control study 142

[**Example 5.25.**](#) Using dose–response analysis to examine potential selection bias in a case–control study 143



[**Example 5.26.**](#) Using external data on exposure prevalence to examine potential selection bias in a case–control study of pesticide exposure 143

[**Example 5.27.**](#) Using external data on exposure prevalence to examine potential selection bias in a case–control study of opium exposure 143



[**Example 5.28.**](#) Using triangulation of findings from different control groups to examine biases in a case–control study of pesticide exposure 144



[**Example 5.29.**](#) Comparisons across studies to examine potential biases in case–control studies 144



[**Example 5.30a.**](#) Identifying potential selection bias in a nested case–control study of breast cancer 145



[**Example 5.30b.**](#) Quantitative bias analysis to examine potential selection bias in a nested case–control study of breast cancer 147



[**Example 5.30c.**](#) Confidence interval estimation when quantifying selection bias for a nested case–control study of breast cancer 148



[**Example 5.30d.**](#) Probabilistic bias analysis to examine potential selection bias in a nested case–control study of breast cancer..... 149



[**Example 5.30e.**](#) Applying probabilistic bias analysis results to estimated odds ratios in a nested case–control study of breast cancer 149



[**Example 5.31.**](#) Immortal time bias in a registry study related to solar radiation exposure..... 151



[**Example 5.32.**](#) Examining reverse causation in a case–control study of oesophageal cancer..... 151



[**Example 5.33.**](#) Examining protopathic bias in case–control studies of opium use and cancer 151



[**Example 5.34.**](#) Evaluating the potential impact of protopathic bias in a study of pancreatic cancer..... 152

[**Example 5.35.**](#) Inappropriate adjustment for a collider..... 152

[**Example 5.36.**](#) Modelling using biomarker-based proxies of exposure in a study of herbicide exposure..... 153

[**Example 5.37.**](#) Differential errors resulting from use of biomarkers in studies of Burkitt lymphoma..... 154

Chapter 6. Incorporating bias assessments into evidence synthesis



[**Example 6.1.**](#) Selection of key biases for night shift work 163



[**Example 6.2.**](#) Selection of key biases for opium consumption 163



[**Example 6.3.**](#) Specifying key confounders 165



[**Example 6.4.**](#) Assessing exposure misclassification..... 166



[**Example 6.5.**](#) Identifying selection bias 167



[Example 6.6.](#) Bias assessment summary table 168



[Example 6.7.](#) Bias assessment summary with few informative studies 169



[Example 6.8.](#) Bias assessment summary using triangulation 171



[Example 6.9.](#) Multiple-bias analysis 172

Chapter 7. Study reporting considerations to facilitate quantitative bias assessment with access to original data



[Example 7.1.](#) Red meat consumption and cancer 180



[Example 7.2.](#) Water arsenic concentration and cancer 181



[Example 7.3.](#) Use of a negative control outcome in a study of hypertension and cancer 183



[Example 7.4.](#) Use of a negative control exposure in a study of maternal alcohol consumption and hypertensive disorders of pregnancy 184



[Example 7.5.](#) Indirect methods to evaluate confounding in a cohort of lead smelter workers 185



[Example 7.6.](#) Bias from inadequate adjustment for time-varying confounding 186



[Example 7.7.](#) Use of g-methods to control for time-varying confounding in a study of titanium dioxide exposure 186



[Example 7.8.](#) Explaining assumptions about differential sources of error 188



[Example 7.9.](#) Regression calibration to quantify bias due to measurement error 188



[Example 7.10.](#) Probabilistic bias analysis to quantify recall bias 189



[**Example 7.11.**](#) Case-case analyses to quantify recall bias 190



[**Example 7.12.**](#) Interphone study on mobile phone use and the risk of brain tumours 192



[**Example 7.13.**](#) Mobile phone use and the risk of uveal melanoma 194



[**Example 7.14.**](#) Selection probabilities in the Interphone study 195



[**Example 7.15.**](#) Loss to follow-up and the association between shift work and breast cancer 197



[**Example 7.16.**](#) Case-control study of opium exposure and oesophageal cancer 199