Index

Note: Page numbers in *italics* refer to Figures; those in **bold** to Tables.

absolute comparison, 75
absolute measures of effect, 75, 153, 168
acquired immunity, 261, 263–4, 264
active immunization, 264
active surveillance, 105–6
actuarial adjustment, 61
actuarial method of survival analysis, 360–2
adjustment for multiple factors, 89–90
admissibility (eligibility) criteria, 149–50, 165
adoptive immunization, 265
Advisory Committee to the U.S. Surgeon General, 1964, Report of, 49–50
age adjustment (age standardization), 84
age intervals, 375
Age of Enlightenment, 10, 31
agents, 45, 256
agreement, 223, 224–8
aggregate-level data, 116
aggregate-level variables, 120–1
aggregation bias, 119–20
all-or-none phenomenon, 43
alternative hypothesis, 312
ambidirectional cohort studies, 164–5, 164
analyzed-as-randomized analysis, 164–5
analytic epidemiology, 104–5
annual mortality rate, 375, 380
antigens, 264
antilogs, 307
apparent prevalence, 231–2
artifactual fluctuations in reported rates, 353–4
attention bias, 146
attributable fraction
  in exposed cases, 81
  in population, 79–81, **80, 81**
average risk, 43, 69
B lymphocytes, 264
baseline comparisons, 149
Bayes factor, 320
Bayesian formula,
  for predictive value positive, 233
  for prevalence, 232–3
bell-shaped curve, 315
Berkson’s bias, 211
Bernoulli’s binomial distribution, 314
bias, 83
binomial test, 314
biological cycles, 261
biological interdependence, 337–8
biological variation, 205
birth certificates, 107
blinding (masking), 147, 151
blocked designs, 148
bloodletting, 15–16, 16
Brennan-Prediger kappa coefficient, 228
British Doctors Study, 28–30, 163
carriers, 258
cart-before-the-horse bias, 134
case definitions, 151, 163–4, 182, 274, 347–51, 354
AIDS (example), 350
chronic fatigue syndrome (example), 348–50,
  **349**
classification of status based on certainty, 350–1
multiple-choice criteria, 348
case–control odds ratio as relative risks, 193–4
case-control studies, 135–7, 180–200
data analysis, 186–92
identifying cases and controls, 182–5
obtaining information on exposure, 185–6
case series, 23–4, 105, 135
cases, ascertainment of, 182–3
catchment area, 183
causal complements, 43
prevalence of, 43–4
causal inference, 48–74
causal inference framework (Hill), 50–6
analogy, 55–6
biological gradient, 51–3
biological plausibility, 53
coherence, 53–5
consistency, 50–1
experimentation, 55
specificity, 51
strength, 50
temporality, 51
causal interactions, 43, 337
causal mechanism, 127
causal models, 41–7
causal pies, 42
causal web, 44–5, 45
cause, definition of, 41–2
cellular and physiologic barriers to infection, 263
chance, 205, 225, 226
chemical barriers to infection, 263
chi-square test of association, 315–17
for statistical interaction, 340–1
Cholera, 19–24, 110, 111, 114, 119, 120, 276–7, 280
chronic carriers, 258
Clever Hans effect (obsequiousness bias), 213
clinical trials, 137, 142
closed population, 67, 67, 101
clustering, 389–90, 394–5
Cochran–Mantel–Haenszel chi-square statistic, 368–9
Cochran–Mantel–Haenszel summary risk difference, 366–8
Cochran–Mantel–Haenszel summary risk difference estimate, 330
cofactors, 127, 128
cohort, definition, 67, 67, 101, 159
cohort analysis, 22–3
cohort life table see generational life table
cohort studies, 52, 135–7, 159, 180
common outcome, 102
common vehicle spread, 260–1
community trials, 137, 142
comparability, 148
component cause model, 42
confidence interval estimation, 304
confidence intervals, 206–8, 206, 304–11, 304
for odds ratios, independent samples, 310
for odds ratios, matched pairs, 310–11
for proportion differences (risk differences and prevalence differences), 308–9
for proportion ratios (risk ratios and prevalence ratios), 306–7
for proportions (incidence proportion and prevalence), 304–5
small sample methods, 305–6
for rate differences, 309–10
for rate ratios, 308
for rates, 306
confidence level, 207
confirmed cases, 350
confounded comparisons, 83
confounders, 213
properties, 213, 214–15
confounding, 165–6, 210, 213–16, 343–4
prevention of, 323–5
contact, 260
contagion variables, 121
contextual variables, 120–1
contributing component causes, 43
control group, 130–1, 146
control series, 135
control variables, 128
controls per case, number of, 184
controls, selection of, 183
convalescent carriers, 258
cooperation of study population, 163
counterfactual ideal, 165
Cox proportional hazards regression, 152
cross-over design, 147
cross-product ratio, 182
cross-sectional life tables, 373, 374
cross-sectional observation, 133–5
cross-sectional studies, 137
crude measures of association, 327
crude rate, 83
cumulative incidence proportion (risk) at time t, 365
cumulative incidence proportion (risk) difference, 365
cumulative incidence proportion (risk) ratio, 365
cumulative incidence sampling, 194
cumulative incidences, 69
current (cross-sectional) life tables, 373, 374
cutoff point for test results, 235–8
cyclozoonoses, 259
data, 128–9
Data and Safety Monitoring Board (DSMB), 130
data collection forms, 129
death certificates, 107–8
death rate, 375
decisions, types of, 48–9
definition of epidemiology, 2
degenerative diseases, 6
demographic changes, 20th century, 5–7
US, 6
demographic transitions, 5
denominator, 67, 101
dependent variable, 128
descriptive epidemiology, 104–25
definition, 104–5
egological correlations, 116–19
epidemiological variables, 108–15
detection bias, 134
diagnostic bias, 134
diagnostic suspicion bias, 213, 274
diagnostic tests, 223
dichotomous exposure, 186
differential misclassification, 212
dimensionality of ratio, 101
direct adjustment, 84–5
direct causes, 44
direct notification, 272
direct zoonoses, 259
disease, definition, 4, 74
disease patterns, 20th century changes in, 5–7
diseases of civilization, 6
Doll, Richard, 28–30, 163
dot maps, 277
double blinding, 151
Durkheim, Emile, 25
ecological analysis, 21, 22
ecological correlations, 116–19
ecological fallacy (aggregation bias), 119–20
ecological studies, 116, 137
ecology of disease, 46
effect measure heterogeneity, 338, 340
effectiveness analysis, 151–2
empirical induction period, 39, 39
endemic disease, definition, 19
endemic pattern, 113, 113
environmental factors, 45
epidemic, definition, 2, 19
epidemic curve, 113, 114, 114, 275, 276, 277
epidemiologic computing, 389
epidemiologic homeostasis, 46, 47
epidemiologic studies, common types of, 137, 137
epidemiologic surveillance systems, 272
epidemiologic transition, 5, 30
epidemiologic variables, 108–15, 275
expected proportion of agreement due to chance, 227
expected survival time, 358
exposure, 74
F index, 228
generational (cohort) life table, 373
G index, 228
Hawthorne effect, 146
health surveys, 108
health, definition, 3
healthy worker effect, 211
Henle, Jakob, 13
herd immunity, 265–6, 266
Hill, Austin Bradford, 28, 163
Hippocrates, 9, 10, 161
history, 8–30, 31
HIV/AIDS, 37–8, 39
HIV/AIDS case definitions, 350
hospital admission bias, 211
host factors, 45
host immunity, 261–4
Framingham Heart Study, 160, 163, 167, 168, 169–70
Framingham, 303
Framingham Heart Study, 160, 163, 167, 168, 169–70
Framingham, 303
Framingham Heart Study, 160, 163, 167, 168, 169–70
Framingham Heart Study, 160, 163, 167, 168, 169–70
Framingham Heart Study, 160, 163, 167, 168, 169–70
Framingham Heart Study, 160, 163, 167, 168, 169–70
Framingham Heart Study, 160, 163, 167, 168, 169–70
Framingham Heart Study, 160, 163, 167, 168, 169–70
G index, 228
generational (cohort) life table, 373
G index, 228
G index, 228
generational (cohort) life table, 373
G index, 228
G index, 228
G index, 228
generational (cohort) life table, 373
G index, 228
G index, 228
infectious cycles, 261
infectious disease, 256, 257
infectious disease process, 255–65
infectivity, 47
inflow, 73
information bias, 205, 210, 212–13
informed consent, 129
innate immunity, 261, 262, 264
institutional review boards (IRBs), 129
integral group properties, 120
intention-to-treat (analyzed-as-randomized, effectiveness) analysis, 151–2
interaction, types of, 337–40
International Classification of Disease (ICD), 351–3, 354
interval estimation, 206, 304
John Henry effect, 146
Kaplan-Meier method of survival analysis, 362–4
Kaplan-Meier product-limit method, 362
kappa paradox, 227–8
kappa statistic, 225–7
killed vaccines, 264
Koch, Robert, 13
laboratory and environmental studies, 280–1
laboratory investigation, 287
Lane-Claypon, Janet Elizabeth, 162
latent period, 39, 39
law of large numbers, 324
life expectancy, 7–8
life table, 373
abridged, 375, 380–3
complete, 374–5
construction, 377–80
stationary population, 374
lifestyle diseases, 31
Lind, James, 144–5
London Epidemiological Society, 2, 17, 31
longitudinal observations, 133–5
longitudinal studies, 137
Louis, Pierre Charles Alexandre, 14, 15–16, 15
lower confidence limit (LCL), 206, 206, 304
Lucretius, 12–13
Louis, Pierre Charles Alexandre, 162
macro-level causes, 44
Mantel–Haenszel adjusted rate difference parameter, 333
Mantel–Haenszel chi-square statistic, 316, 333–5, 334
Mantel-Haenszel confidence interval for risk ratio, 328–9, 334
Mantel-Haenszel methods, 323–36
Mantel-Haenszel risk ratio, 325–9
confidence interval for, 328–9, 334
heterogeneity assumption, 326
homogeneity assumption, 326–7
mixing of effects, 325–6
Mantel–Haenszel summary incidence proportion (risk) ratio, 327–8
Mantel–Haenszel summary odds ratio, 330–1
Mantel–Haenszel summary rate ratio, 331–3
Mantel–Haenszel test statistic, 329
mapping, 111
margin of error, 206
masking see blinding
mass action principle, 267
match tuples, 191–2
matched pairs, 189–91
matching, 165–6, 324–5
maternally derived passive immunity, 264
maximum-likelihood estimate (MLE) technique, 340–1
McNemar’s test for matched pairs, 319
measure of association heterogeneity, 338
measures of association, 74–9
measures of disease frequency, 67–74
measures of effect, 74, 152–3, 166–170, 186–192
absolute, 75–6
relative, 76
measures of occurrence, 67
measures of potential impact, 79–82
Médicine d’observation, 14–16
medical ecology, 13
MedWatch (FDA), 107
metaphor in random and systematic error, 201–2, 202, 203
metazoanoses, 259
Méthode Numerique, La, 14–16
miasma theory of transmission, 20
micro-level causes, 44
Minimum Bayes factors, 319–21
calculation, 320–1
misclassification bias, 212
misinterpretation, 209
modified life table, 360
modified live vaccines, 264
morbidty, evolving patterns of, 5–7, 30–31
mortality, 5–7
evolving patterns of, 30–1
leading causes, US, 5
trends since, 1950, 7, 8
multilevel analysis, 121
multiple levels of exposure, 186–7
national morbidity and mortality databases, 107–8
National Notifiable Disease Surveillance System, 107
natural experiment, 145–6
natural history of disease, 36–40
natural logarithm, 306
nested case-control studies, 183
nondifferential misclassification, 151, 212–13, 212
non-experimental epidemiologic studies, 131
nonrandomized trials, 131, 144
nonresponse bias, 211
normal approximation, 305, 314
nosocomial infections, 259
notation, 181, 203
null distribution, 312, 313, 314
null hypothesis, 208, 209, 312, 315, 317
numerator, 67, 101
obsequiousness bias, 213
observation, 56
observational cohort studies, 159–79
  assembling and following a cohort, 163–4
  birth cohort study (Frost), 170–4
  confounding, 165–6
  data analysis, 166–70
  historical perspective, 161–3
  prospective, retrospective and ambidirectional
  cohorts, 164–5
  observational studies, 131–2
  observed proportion of agreement, 226
  observed rate, 357–8
  odds, 102
  odds ratio, 77–8, 78, 181
  odds ratio estimate, 310
  odds ratio estimator, 310
  open population, 67, 68, 72
  OpenEpi.com, 153–4, 154, 155, 156, 157, 158, 169, 305
  outbreaks
    drug-disease outbreak (case study), 283–6
    food borne outbreak (case study), 286–291
  goals and methods of investigations, 272–3
  initial detection, 272
  investigatory steps, 273–82
  communication of findings, 282
  control and prevention methods, 281
  descriptive epidemiologic studies, 275–9
  establishment of outbreak, 273–4
  hypothesis development, 279–80
  hypothesis evaluation, 280–1
  preparation for field work, 273
  verification of diagnoses, 274,
outflow, 73
overmatching, 324
p-values, 208–9, 312–19
  basis of, 312–13
  fallacies of, 313
pandemic, definition, 19
parallel design, 147
parameter, 202–3, 303
Paré, Ambroise, 145
passive immunization, 264
passive surveillance, 105, 107
Pasteur, Louis, 13
pathogenicity, 47
Pearson’s uncorrected chi-square statistic, 316
per-protocol analysis (efficacy analysis), 151–2
period prevalence, 73
person variables, 108, 109, 110, 127–9
person-time unit, 70
physical barriers to infection, 262
Pinel, Philippe, 14, 162
place variables, 108, 110, 111, 277
placebo effect, 146
point epidemic pattern, 113, 114
point estimate, 206
point estimation, 206, 207
point estimator, 309
point prevalence see prevalence
point-source epidemics, 277
Poisson distribution, 315, 386–8, 388, 395
  fitting, 390
  goodness of fit, 390–4
  Poisson formula, 386
  calculating expected number of cases, 387–8
  use of, 387
polls, political, 210–11
Popper, Karl, 57–8
population, 303
portals of entry and exit, 259–60
possible cases, 350
posterior odds, 320
potential confounders, 128
Pott, Percival, 10–11, 162
precision of estimate, 207
preclinical phase, 36
predicted probability of death, 376–7, 382
  in first year of life, 376
prediction, 56
  predictive value of a negative test (PVNT), 230–1
  vs prevalence, 234–5, 235
  predictive value positive of a positive test (PVPT), 230–1
  vs prevalence, 232–4, 234
prevalence, 72–4, 74
  Bayesian formulas for, 232–3
  vs incidence, 74, 74
  mathematical relationship between incidence and,
  103
  vs predictive value of a negative test (PVNT), 234–5,
  235
  vs predictive value positive of a positive test (PVPT),
  232–4, 234
prevalence difference, 75
prevalence-incidence bias, 134–5, 211
prevalence proportion see prevalence
prevalence ratio, 76–7
prevalent cases, 183
preventable fraction, 82
  in the population, 82
  in the unexposed, 82
primary prevention, 40
prior odds, 320
probability, 204–5
probabilities of death, 375
probable cases, 350
propagating epidemic pattern, 113, 114, 277
proportion, 101–2
  of specific negative agreement, 228
  of specific positive agreement, 228
  testing, 314–15
proportion ratio parameter, 306
proportional-hazards regression, 166
prospective cohort studies, 164–5, 166
public health, definition, 2–3
publicity bias, 211, 274
quadratic method, 305
qualitative method, 280
quantitative epidemiologic investigations, 280
Ramazzini, Bernardino, 10, 161–2
random distribution in time and space, 385–6
random error (imprecision), 201–3, 204–9
random noise, 205
randomization, 148, 324
randomized controlled trial (RCT), 144, 148
randomized trials, 131
rare outcome, 102
rate, 101
constant, 102–3
rate adjustment, 82–4
rate difference, 75, 76, 153, 168, 309–10, 318–9
rate ratio, 75, 76, 77, 152, 166–8, 308, 318–9
rates by region, 277
rates, predicting probabilities from, 375–6
ratios, 67, 101
real population, 303
recall bias, 213
recruitment, 149–51
rectangularization, 374
Reed-Frost model, 267
reference (control) group, 130–1
reference population, 84
referent (control) groups, 146
refutation, 57–8
regression models, 325
relative comparison, 75
relative measures of effect, 152
relative risks (RR), 76
vs relative risk difference, 77
reliability (agreement), 223, 224–8
reproducibility, 224
reservoirs, 257
resolution, 36
restriction, 324
retrospective cohort studies (historical cohort studies), 164–5, 164
reverse-causality bias, 134
risk, perception of, 102
risk difference, 75, 76, 153, 168–9, 308–9, 315
vs risk ratio, 78–9
vs relative risk difference (RRD), 77
at selected points in time, 381–2
risk multiplier, 76
risk ratio, 76, 77, 152, 166, 306–7, 315
vs relative risk difference (RRD), 77
vs risk difference, 78–9
at selected points in time, 381–2
Russell, Bertrand, 57
Salmon, Daniel E., 13
sample size, 127
considerations, 184–5
requirements, 155
saprozoones, 259
screening, 222–54
HIV/AIDS case study, 244–8
secondary prevention, 40
selection bias, 163, 205
sensitivity (SEN), 229, 230
serial transfer, 261
shoe-leather epidemiology, 274
'shooting for', 203
sickness, definition, 4
significance testing, 208, 312
signs, 223
Simpson’s paradox, 325, 326
smoking, 28–9, 29, 30
Snow, John, 13, 19–24, 20, 31, 111, 112, 276, 277
publication, 24
cohort analysis, 22–3
case series, 23–4
ecological analysis, 21, 22
source population, 149, 183
specificity (SPEC), 229, 230
spectrum of disease, 40
sporadic occurrence, 113, 113
stage of clinical disease, 36
stage of subclinical disease, 36
stage of susceptibility, 36
stages of disease, 36–9, 37
stages of prevention, 40
standard error, 308, 330
standard error of the natural log of Mantel–Haenszel incidence proportion ratio, 328
standard error of the natural log of the odds ratio, 310
standard error of the natural log of the proportion ratio, 306
standard error of the proportion, 305, 314
standard error of the rate difference, 309
standard error of the risk difference, 309
standard million, 84
standardized morbidity ratio (SMR), 85–6
stationary population, 67
statistical adjustments, 166
statistical inference, 153, 205–6
statistical interaction, 337, 338–40
statistical testing, fallacies of, 313
strategy for stratified analysis, 342–4
stratification, 325
stratified analysis, strategy for, 342–4
stratified designs, 148
stratifying rates by follow-up time, 359–60
stratum, 84
study population, 84
sufficient causal mechanism, 42, 42
sulfur oxide air pollution, 47
surveillance systems, 105–7
Survival, Epidemiology and End Results (SEER), 106–7
survival analysis, 356–9
actuarial method, 360–2
comparison to two groups, 364
Kaplan-Meier method, 362–4
survival function, 362
comparison, 366–8
Sydenham, Thomas, 10
symptomatic cases, 258
symptoms, 223
synergism, 337
systematic error (bias), 201–3, 209–11
T lymphocytes, 264
tertiary prevention, 40
therapeutic derived immunity, 264
time variables, 108, 111–15, 113, 275–7
toxoids, 264
transmission, 260–1
dynamics, 260–1
mode of, 260
trials, 142
triple blinding, 151
true negatives (TN), 229
true positives (TP), 228
true prevalence, 231–2

unit of concern, 2
unit of observation, 116, 132–3
upper confidence limit (UCL), 206, 206, 304
US life table survival curves, 373, 374
uses of epidemiology, 4–5

vaccines, 264
validity, 223, 228–38

van Helmont, 144
variables, 128
vectors, 260
vehicles, 260
verification, 56
virulence, 47

Weinberg, Wilhelm, 162
WinPEPI, 153, 155, 155, 170, 228, 305, 315, 364, 389
withdrawal bias, 211
withdrawals, 163

Yates’s continuity-corrected chi-square statistic, 316
yellow shank disease, chicken, 44

z statistic, 318
zoonoses, 258–9