Index

absorbing state models (Markov), 321
acceptability curve (CEA), 379–81, 380
affect heuristic, 401–2, 402
Airoldi, M., 264
Alf, E., 189
algorithms. See also derivation
   calibration, 347–9
   clinical, 21, 21–2
Allais, M., 408
alternative weighing
   consequence modeling, 12–15, 13, 14
   decision tree, 9, 9, 11
   PROACTIVE, 25
   trade-off estimation, 15–16
amortization (health-care costs), 252–4
analysis guidelines, 281–4
anchoring and adjusting heuristic, 142, 400
appraisal. See systematic review
   articulation (individual), 97
   assessing agreement (calibration), 345–7
   attributes. See discrete choice experiments
   (DCE) (individual)
availability (probability)
   as subjective disease estimate, 141
   heuristic, 397–8
   averaging out, 49–51, 50, 62
   aversion (risk), 104, 403–8
   averted costs (CEA), 248–9
balance sheet, 13–15, 14, 60–1, 61, 148
Barbieri, M., 284
Bayes’ formula
   and data subjective probability, 234
   applying, 133
   derivation of, 132–3
   for multiple diseases, 205
   for multiple tests, 179
   for multivariable models, 183–6, 184
   odds-likelihood-ratio form, 136–9, 137
   to decision trees, 157
   with tree inversion, 134, 134–5
bias
   data source, 220–1, 221
   in heuristics, 397–402
   in summary estimates, 223–6
   bootstrapping (dataset), 367
Boyston, Z., 53–6
Brazier, J., 263
Brown, M. L., 280
calibration. See also validity, estimation
   assessing agreement, 345–7
   definition, 344–5
   for multiple test validity, 190–2
   parameter search strategies, 347–9
Cancer Intervention and Surveillance Modeling Network (CISNET), 351
categorical test results, 165, 180
CEA. See cost-effectiveness analysis (CEA)
certainty
   effect, 409
   equivalent, 106
chained gamble, 93–4
chance tree, 12–13, 134, 134–5.
See also survival curves
Claxton, K., 269
clinical algorithm, 21, 21–2
clinical encounter (patient), 80–3, 84
clinical studies (finding best), 211–16, 214
Cochrane Library (database), 10–11, 216–17
cohort simulation (Markov evaluation tool) and heterogeneity, 362
in recurring events, 307, 307–15, 309, 313, 315
combination of health measures, 259–64
probability, 46, 46–9, 49
test result, 179–86, 180, 184
communication (patient), 97
competing choice problem (CEA), 270, 273, 273–4, 278–9, 279
complexity of decision making, 1–3, 23
of valuing outcomes, 99
components
CEA, 244–5
problem, 3
computer databases, 10–11, 213–17, 214, 280
conditional independence (tests), 181–2
conditional probabilities, 47, 122–4
confidence interval, 47–8
confounder, 42
consequence modeling (PROACTIVE), 12–15, 13
constrained resources and health outcomes, 264–9, 266
cost-effectiveness analysis, 269–80, 271, 272, 273, 277, 279
economic analysis, 245–58, 285–9
effectiveness measures, 258–64
efficient allocation of, 238–45, 240
guidelines, 281–3
justice and equity in, 284–5
transferring analysis data, 283–4
uncertainty in, 280–1
construct validity (model), 349–50
Consumer Price Index (CPI), 254–5
continuous test results, 165, 171–7
control (of health-care costs), 239–41, 240
controlled clinical trials for intervention benefits and risks, 10–11
cost–benefit analysis in monetary terms, 241
valuing outcomes in, 257–8
cost-effectiveness analysis (CEA).
See also net harm (treatment), net benefit (treatment) and societal decision making, 112–13
cost components, 246–50
effectiveness measures, 258–64
mix of perspectives in, 240, 242–4
model, 244–5
uncertainty in, 375–81, 376, 380
with constrained resources, 269–83, 271, 272, 273, 277, 279
cost-effectiveness plane, 240, 240
cost-minimization analysis, 240
costs. See also price and balance sheet, 14–15
and decision making, 96
and risk, 104–5
as economic resources, 238, 245–58
joint distribution of, 377–81
Cox proportional hazard model (survival), 337
CPI. See Consumer Price Index (CPI)
cross-validation (model), 351
curve acceptability, 379–81
ROC, 172–6, 187–90, 205–6
survival, 86–7, 302, 314–15, 335, 335, 336
cycle. See also time
corrections in Markov models, 314–15, 315
in state-transition decision models, 304, 304–5
on cohort simulation, 305–6
cycle trees (Markov), 324–6, 325, 326
data ambiguity, 4
availability and cycle length, 305
clusters, 204
Index

data sources
finding best, 209–11
meta-analysis for inconsistencies, 226, 226, 230
studies, 211–16, 214
systematic reviews of, 216–26, 219, 221, 223
decision analysis
and data sources, 209–11
and values, 80–5, 82, 84, 96–8
decision guides, 20–3
decision making. See also resource allocation
and truth, 231
and when to test, 145–6, 146
best studies to use, 223, 223–6
complexity of, 1–3, 23
paradigms, 109–13
psychological aspects of, 392–411
societal, 83–5
uncertainty in, 3–5
decision-making alternatives, 8–16, 18, 58–62
decision process models (Markov), 328–31
decision tree
alternatives, 11
and diagnostic information, 59, 59–60, 60, 72–6, 73, 75
as combined chance tree, 17
becoming clinical algorithm, 21
compared to state-transition decision models, 300–2, 301, 303
definition, 9
extensive form, 74
for positivity criterion, 194
for threshold decisions, 157, 160
forms of, 73, 73–4, 75
sequencing decision nodes, 74–6, 148
strategic form, 74
with risky options, 55
Declining Exponential Approximation of Life Expectancy (DEALE) estimation, 338–9
delta method (sensitivity analysis), 372–3, 387
derivation. See also algorithms
delta method (sensitivity analysis), 387
dISCOUNTING costs, 264–7
value of information analysis, 387–8
diagnosis
versus prognosis, 178
Diagnostic Imaging for Coronary Artery Disease (DICAD) consortium, 167, 168
diagnostic information
and Bayes’ formula, 131–9, 134, 137
and disease probability estimates, 140–3
and probability, 118–31, 122, 125, 127, 130, 131
expected value, 160–3, 161
indices for dichotomous tests, 139–40
diagnostic tests. See also test results in intervention selection, 11–12
diagnostic uncertainty, 34
disability-adjusted life years (DALYs), 98, 259–60, 262–4, 270–9, 271, 272, 273, 276, 284–5. See also quality of life
discount rate (economics), 269
discounting costs, 264–9, 265
discrete choice experiments (DCE)
(individual), 97–8
discrimination (in multiple-test validity), 187, 187–90, 189
disease
communicable, 242
multiple states of, 205
scales, 262
survival curves without, 310
do-nothing alternative (decision making), 9, 9–10, 11
Dorfman, D. D., 189
dynamic transition models (Markov), 331–2
economic evaluation. See cost-effectiveness analysis (CEA)
effectiveness measures
CEA, 258–64
linear combinations of, 378–9
emergency conditions (treatment options in), 56–8
EQ-5D. See EuroQol health index (EQ-5D)
equivalence measures (outcomes metric), 96
estimation. See also validity. See also calibration
parameter, 335, 335, 336, 342
trade-off, 15–16
ethics, 284–5. See also values
EuroQol health index (EQ-5D), 100–2, 112, 262–3
evidence
hierarchy of, 209–10
expected net benefit of sampling (ENBS), 386
expected value. See also value of
information analysis, uncertainty and balance sheet, 16–18, 17
definition, 16, 49–51, 50
of diagnostic information, 155, 160–3, 161
optimization, 18–19, 62
expected value of clinical information (EVCI), 160–2. See also number-need-to-test
expected value of partial perfect information (EVVPI), 384–5
expected value of perfect information (EVPI), 160, 161, 382–4
expected value of sample information (EVSI), 385
exploration (assumption), 19
extended dominance analysis (CEA), 274–8, 276
extensive form (decision tree), 73, 73–4, 75
external validation (model), 351
face validity (model). See construct validity (model)
false-negative ratio (FNR), 122, 123, 125
false-positive ratio (FPR)
and net proportional benefit, 201–3
definition, 122, 123, 125
multicategory test results, 171–7, 174, 176, 177, 206
Ferrer-I-Carbonell, A., 255
Fintor, L., 280
first-order uncertainty. See stochastic uncertainty
fitting. See calibration
folding back, 62
framing effects (Prospect theory), 403–5
Franklin, B., 53–4, 56
friction cost method (productivity), 256–7
Functional Capacity Index, 262
fundamental matrix solution (Markov evaluation tool), 307
fundamental objective, 8
future research
multiple test results, 205–6
need to be justified through information analysis, 381–2
population expected values, 383–6
valuation methods, 107–9
gamblers. See seeking (risk)
genetic algorithms (calibration), 348–9
George, B., 286
goodness-of-fit. See assessing agreement (calibration)
Gravelle, H., 269
gray zone. See threshold Grundy, 382
Hammond, J. S., 5
Hanson, K., 264
harms (potential)
and balance sheet, 14–15
health index
cross-walking, 99
utility assessment, 100, 100–2
Health Utilities Index (HUI), 100–1, 262
health-care
costs, 246, 249–55
main focus, 7
health-care interventions (CEA cost), 246, 249–50
health-care resources (CEA cost), 251–5
health states
worse than dead, 102
heterogeneity
analyzing, 361–6, 362
and uncertainty types, 359
types of, 358
heuristics (in information processing), 397–402
hierarchy
of evidence, 209–10
simulations, 373–5, 374
HUI. See Health Utilities Index (HUI)
human capital method (cost-benefit analysis), 257
incremental cost-effectiveness ratio (ICER), 376, 376–9
independence (probabilistic), 47–8
index
CPI, 254–5
EQ-5D, 100–2, 112, 262–3
HUI, 100–1, 262
NRI, 199–200
SF-6D, 100–1
Youden’s, 140
indices for dichotomous tests (diagnostic), 139–40
indices for multiple test results
clinical utility, 197–203, 198, 200, 203, 204
validity, 186–92, 187, 189, 191
inflation, 254–5
information
and anchoring heuristic, 400
diagnostic, 72–6, 73, 75
in intervention selection, 11–12
partial perfect, 384–5
perfect, 160, 161, 382–4
sample, 385
value of analysis, 381–8
integrated discrimination improvement (IDI) index, 200–1
integration
evidence, 16–18, 17
expected value optimization, 18–19
integration and exploration (PROACTIVE), 25
internal validity (model), 350
International Society for Pharmacoeconomics and Outcomes Research, 283
intervention alternatives, 10–11, 11
and cost-effectiveness plane, 240, 240
effectiveness, 212
intuition (in decision making), 410–11
Jenner, E., 53
Johannesson, M., 250
joint probability, 48–9
Kahneman, D., 393–4, 398–9, 403–9
Koopmanschap, M. A., 255–7
league tables (CEA), 280
life expectancy
adding years to as analysis tool, 249–50
and utility assessment, 105–6
calculating using cohort simulation, 308–10, 309
estimating variables in, 337–41
in CEA, 264
recurring events during. See Markov models
life table analysis, 335–6, 336
likelihood ratio (LR)
and calibration, 346
definition, 138
for dichotomous test, 138–40
for multivariable models, 185–6
in conditional independent tests, 180, 180, 182–3
multicategory test results, 168, 168, 168
result-specific, 175–6, 177
uninterpretable test results, 176–7, 177
limited resources. See constrained resources
Loomes, G., 409
LR. See likelihood ratio (LR)
mapping rules (utility assessment), 101–2
Markov models
cycle trees, 324–6
decision process, 328–31
dynamic transition, 331–2
estimating probabilities in, 326–8
evaluation tools for, 307–19
standard, 302–6
states, 319–24
MASS. See Multi-centre Aneurysm Screening Study (MASS)
Mather, C., 53–6
McNeil, B., 404
mean. See expected value
Medical Outcomes Study (SF-36), 88, 259–60, 263
MEDLINE (database), 214–15
Meltzer, D., 250
meta-analysis (data source), 225, 226, 230
See also systematic review
microsimulation. See also Monte Carlo simulation (and state-transition models)
state-transition decision models, 362–5, 363
using discrete stochastic event simulation, 365–6
modeling
consequence, 12–15, 13, 14, 25
PROACTIVE, 20–3, 21, 72–6
structure uncertainty, 359, 373
validity in, 334, 349–52
money. See price, costs
monitoring (problem policy), 9–10
Monte Carlo simulation See also microsimulation
for recurring events, 315–19, 316, 328–30
of stochastic uncertainty, 366–7
sensitivity analysis, 368–72, 369, 371
more information alternative (decision making), 9
Morton, A., 264
multicategory test results
post-test probability, 166–71, 168, 168, 170
trade-offs, 171–7, 174, 176, 177, 206
Multi-centre Aneurysm Screening Study (MASS), 351–2
multiple test results clustered data, 204
combining, 179–86, 180, 184
future research in, 205–6
indices of clinical utility, 197–203, 198, 200, 203, 204
indices of validity, 186–92, 187, 189, 191
multiple disease states, 205
positivity criterion, 192–7, 194, 197
test threshold, 157
multivariable test models
Bayes’ formula, 183–6
for multiple test validity, 197
positivity criterion, 196–7, 197
National Institute for Health and Clinical Excellence (UK), 112, 282, 286
National Institutes of Health (US), 282
natural history
and consequences, 12
potential dire consequences, 6
Nelder-Mead algorithm (calibration), 348
net benefit (treatment), See also cost-effectiveness analysis (CEA)
extected from sampling, 386
for multiple test validity, 201–3, 203
foregone calculation, 381–2
linear combinations of, 378–9
positivity criterion, 195–6
treatment threshold, 64, 67–8, 155, 156
net harm (treatment), 64, 68, 154–6, 195–6.
See also cost-effectiveness analysis (CEA)
Net Reclassification Improvement (NRI) index, 199–200
neutral (risk), 104–5, 105
no treat–test threshold, 146, 147–54, 157
non-absorbing state models (Markov), 322, 322, 324
non-competing choice problem (CEA), 270–3, 271, 272, 278–9, 279
NRI. See Net Reclassification Improvement (NRI) index
number-needed-to-test, 163.
See also expected value of clinical information (EVCI)
office (PROACTIVE), 7, 25
odds. See probability
odds-likelihood-ratio form (Bayesian revision), 136–9, 136, 166
opportunity cost, 238, 245–6, 251–5
ordinal test results, 165, 171–7
outcomes
and balance sheet, 14
and guideline creation, 20–1
and values, 78–80, 85–6
CEA measures of health, 258–64
consequences, 13, 13, 14
discounting costs, 264–9, 266
framing effects and, 403–5
with constrained resources, 264–9, 266
Panel on Cost-effectiveness in Health and Medicine (report), 289–95
parameter uncertainty, 368, 368, 369, 371.
See also probability
patients. See also society
and values, 80–3, 84, 109–11, 213, 260–1
heterogeneity (Markov), 321
heterogeneity across subgroups, 358, 359
screening (clinical), 80–3, 84, 129–31, 130, 131
wanting a shared decision with physician, 110
percentages. See probability
person trade-off. See equivalence measures
(outcomes metric)
perspectives
reframing from different, 7
toward resource allocation, 242–4
physician
and patient time constraints, 238–9
individual clinical decision making, 109–11
point of indifference, 92, 92, 95
population. See society
positive predictive value, 125, 126
positivity criterion
for multiple test results, 192–7, 194, 197
multicategory test results, 171–7
posterior probability. See post-test probability
post-test probability
definition, 120, 125
for multiple tests, 179–86
for positive and negative outcomes, 124–9, 125, 127
multicategory test results, 166–71, 168, 168, 170
versus pre-test, 153
practicality
PROACTIVE, 23–4
utility assessment, 103–4
predictive values, 125, 126
predictive validation (model), 351–2
preferences. See values
present value (discounting costs), 264–7
pre-test probability
and prevalence, 120–4, 122
choices of reference for, 167
definition, 120, 125
in screening, 129–31, 130, 131
multicategory test results, 171
prior probability. See pre-test probability
price. See also costs
adjustments, 254–5
in health-care arena, 251–2
PROACTIVE decision making approach
analyzing alternative decisions, 9, 9, 11, 13, 14, 58–62, 59, 61
definition, 5, 24–6
integration and exploration, 16–19, 17, 62–72, 64, 65, 67, 70, 72
modeling, 20–3, 21, 72–6
problem, 5–8, 6, 58
reason for using, 23–4
probability. See also uncertainty
and diagnostic information, 118–31, 122, 125, 127, 130, 131
chance tree, 12–13
combining, 46, 46, 46, 49
conditional, 47
disease estimates, 140–3
independence, 47–8
joint, 48–9
Markov model, 326–8
misperception of, 394
multiplication rules, 46
notation, 131–2
revision, 120, 128, 130
treatment threshold, 68
problem
comparing choice, 270, 273, 273–4, 278–9, 279
defining, 23–4
PROACTIVE, 5–8, 6, 58
shopping spree, 270–3, 271
productivity (loss of), 247–8, 256–7
prognosis
versus diagnosis, 178
prognostic factors, 39
prognostic uncertainty, 36
proportions. See probability
Prospect theory, 403–9
psychology (in decision making), 392–411
QALYs. Quality-adjusted life years, 98, 113, 241, 244–5, 259–64, 271–9, 293, 380
quality of life. See also disability-adjusted life years (DALYs) and expected utility, 311–12 and utility assessment, 107–9 and values, 87–8, 102
Raiffa, 382
ranking health states (valuation method), 97 rates (economic), 269, 326–8
rating scale. See also time trade-off, standard gamble and utility values, 99
utility assessment, 89–91, 90
rationality (in decisions)
alternatives to, 402–11
psychology of, 394
receiver operating characteristic (ROC) curve and discrimination, 187, 187–90, 188 and LR, 175–6, 177
challenge, 205–6
diagnostic tests, 172–5, 174, 183, 183
recalssification (for multiple test validity), 198, 198, 200
reference case (CEA guidelines), 281–2 reference gamble. See standard gamble reframing
PROACTIVE decision making approach, 25 problems, 7
Regret theory, 409–10. See also Prospect theory
relative utility (for multiple test validity), 203, 204
representativeness as subjective disease estimate, 142 heuristic, 398–400
research (future)
multiple test results, 205–6
needing to be justified through information analysis, 381–2 population expected values, 383–6
valuation methods, 107–9
resource allocation. See also society, decision making and economic analysis, 285–9
and health outcomes, 264–9, 266
and societal decision making, 111–13
constrained, 238–45, 240
cost-effectiveness analysis, 269–80, 271, 272, 273, 276, 279
economic costs, 245–58
effectiveness measures, 258–64
and equity in, 284–5
guidelines, 281–3
justice and equity in, 284–5
cost-effectiveness analysis, 283–4
societal priorities, 237–8
transferring analysis data, 283–4
uncertainty in, 280–1
results
ability to change treatment choice, 152
and algorithms in, 21, 21–2
balance sheet in, 22
decision guide, 20–1
diagnostic test, 119
variation in study, 226
revealed preference method (outcome metric), 97
risk. See also toll (testing), Prospect theory action threshold, 53–4
Index

risk. (cont.)
and heuristics, 397–402
and uncertainty in modeling, 361
and utility assessment, 104–5, 105
aversion, 104, 403–8
psychology of, 395–6
seeking, 407
risk factors. See prognostic factors
Robberstad, B., 264
ROC. See receiver operating characteristic (ROC) curve
rolling back, 62
Rushby, J. F., 264
safety netting. See monitoring (problem policy)
Schlaifer, 382
Schulz, K. F., 221
screening (clinical)
and pre-test probability, 129–31, 130, 131
patient encounter, 80–3, 84
searching strategy (electronic), 213–16, 214
seeking (risk), 104
sensitive test, 122–4, 139–40
sensitivity, 122, 125
sensitivity analysis
and data sources, 234–5
CEA, 280–1
definition, 63
for parameter uncertainty, 368, 368, 369, 371
in dichotomous test, 19, 63, 65–6, 67, 71–2, 72
to analyze heterogeneity, 361
toll threshold, 159
sequencing
CEA costs, 248–9
in Monte Carlo simulations, 316–18
sequencing decision nodes
breaking problems down into, 301
importance of, 135
SF-36. See Medical Outcomes Study (SF-36)
SF-6D. See Short-Form 6 dimensions health index (SF-6D)
shopping spree problem, 270–3, 271
Short-Form 6 dimensions health index (SF-6D), 100–1
single measures of health (CEA), 258–9
Smith, D., 269
snowballing, 219
society. See also resource allocation, patients and decision making, 83–5
and emotional policy making, 394–5
DALYs, 98
diagnostic testing for, 118
heterogeneity in, 358, 359
heuristics in, 398, 401–2
outcomes metric, 96
perspectives in, 243
population EVPI, 383–4
specific test, 122–4, 139–40
specificity, 123, 125
standard gamble. See also uncertainty, time trade-off, rating scale
and risk preference, 105
utility assessment, 91–4, 92
Stason, W. B., 268
stated preference method (outcome metric), 97
states
disease, 205
Markov model, 319–24
state-transition models
cohort simulation, 307, 307–15, 309, 313, 315
compared to decision trees, 300–2, 301
decision process models, 328–31
dynamic transition models, 331–2
estimating life expectancy, 340–1
estimating probabilities, 326–8
fundamental matrix solution, 307
Markov cycle trees, 324–6, 325, 326
Markov models, 302–6, 304
Markov states, 319, 320, 322, 324
microsimulation, 362–5
Monte Carlo simulation, 315–19, 316, 328–30
stereotypes. See representativeness
stochastic process, 306, 365–6
stochastic uncertainty, 366–7
strategic form (decision tree), 73, 73–4, 75
strategy
   definition, 10
electronic search, 213–16, 214
studies
   bias in, 220–1, 221
   finding best, 211–16, 214
   original, 218–19, 219
   primary, 217
study
   and results variation, 226
   MASS, 351–2
   SF-36, 88, 259–60, 263
subjective probability, 227–34, 230
Sugden, R., 409
summary estimates (data source), 223–6
survival curves. See also chance tree
and half-cycle correction, 314–15, 315
and values, 86–7
estimating variables in, 335, 335, 336
estimation, 334–7
in recurring models, 302
systemic review, 216–26, 219, 221, 223
temporary states (Markov), 319, 319–20
test and treat alternative, 146
test results. See also diagnostic tests
dichotomous, 166
multicategory, 165–71
multiple, 186–97, 205
test variable in, 171–7
testing (dichotomous)
and disease modeling, 74–6
and probability, 119, 119, 122, 125, 127, 130, 131
deciding when to, 145–6, 146
number-need-to-test, 163
test thresholds, 151, 152, 153, 155
with a toll, 158–60
testing (multicategory), 165–71
test–treat threshold, 146, 147–51, 152–4, 153, 157
threshold
test, 151, 152, 153, 155
treatment, 53–4, 64, 64, 65, 70
Tilling, C., 248
time. See also cycle
   as a constrained resource, 238–9
   as CEA cost, 247, 255–6
discounting, 312
dynamic variable events, 331–2
heuristics used as short-cut, 397
life table analysis, 335–6, 336
preferences, 105–6
PROACTIVE, 23–4, 26
prognosis expressed using, 178
stochastic uncertainty over, 359, 360
trade-offs, 94–6, 95, 95
time trade-off, 94–6, 95, 95.
   See also standard gamble, rating
scale
toll (testing), 158–60, 159, 162–3, 326.
   See also risk
tools (Markov evaluation), 307–19
Torrance, G. W., 99
tracker variables (Monte Carlo simulation), 329, 341–2, 362–5, 363
trade-offs
   identification of, 15–16, 56
   multicategory test results, 171–7, 174, 176, 177, 206
   PROACTIVE, 25, 62
time, 94–6, 95, 95
treatment
   best option under diagnostic uncertainty, 56–72, 59, 61, 64, 65, 67, 70, 72
   best risky, 54–6
efficacy, 341
threshold, 53–4, 63, 64, 65, 70
uncertainty in, 4, 41
treatment now alternative (decision making), 9
treatment threshold, 63–71, 148, 148–51, 150
tree
   chance, 12–13, 134, 134–5
cycle, 324–6, 325, 326
decision, 9, 11, 17, 21, 55, 59–60, 72–6,
   157, 160, 300–2
triggering (problem policy), 10
true-negative ratio (TNR), 122, 123–4, 125, 127
true-positive ratio (TPR) and net proportional benefit, 201–3, 203
as conditional probability, 122–4, 125, 127
multicategory test results, 171–7, 174, 176, 177, 206
tunnel states (Markov), 320, 320
Tversky, A., 393–4, 398–9, 403–9
uncertainty and calibration, 344–5
and heterogeneity, 356–8, 373–5, 374
diagnostic, 56–72, 59, 61, 64, 65, 70, 72, 146
in CEA, 375–81, 376, 380, 380
decision making, 3–5
model structure, 359, 361, 373
parameter, 360, 368, 368, 369, 371
residual, 56–8
stochastic, 360, 366–7
types of, 359, 360–1
US Public Health Service (USPHS) CEA guidelines, 281–2
utility definition, 90
function, 90
utility assessment. See also values and CEA, 112, 260
and life expectancy, 105–6
and quality of life, 107–9
health index, 100, 100–2
off-the-shelf, 102
patient risk, 104–5, 105
practicality, 103–4
preference-based measures, 88–99, 259
rating scale, 89–91, 91, 99
relationship between types of, 98–100
standard gamble, 91–4, 92
time trade-off, 94–6, 95, 95
validity. See also estimation, calibration
decision model, 334, 349–52
test result, 186–203
time value of information analysis, 381–8
value optimization and trade-offs, 15
improved quality of life, 8
PROACTIVE decision-making approach, 25
pulmonary embolism (PE), 87–8
values. See also utility assessment, ethics and clinical algorithm, 22
and outcomes, 78–80, 83–6, 98
and quality of life, 87–8, 102, 259–63
as patient bias, 142–3
decision aids for, 22, 80–5, 82, 84, 96–8
time as, 95
Van den Berg, B., 255
verification (model), 350
visual aids (utilities assessment), 95, 103–4
wait-and-see alternative (decision making), 6, 9, 9–10, 13–14, 14
watchful waiting alternative (decision making), 9, 9–10, 56
Weinstein, M. C., 268
what-if analysis. See sensitivity analysis
willingness-to-pay method (cost–benefit analysis), 257–8
for valuing outcomes, 96
World Bank, 98, 263
World Health Organization (WHO), 98, 264
Younen’s index, 140