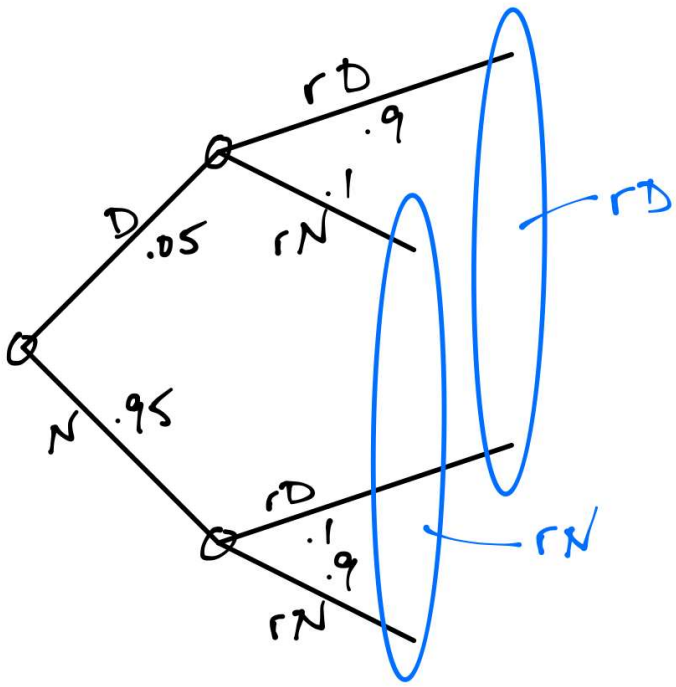
E: Tests for low prevalence diseases - Solution

Decision tree:



Unconditional probabilities:

State	Report	Probability
D	rD	0.05*0.9 =0.045
D	rN	0.05*0.1 =0.005
N	rD	0.95*0.1 =0.095
N	rN	0.95*0.9 =0.855

Probabilities of reports:

Report	Probability

rD	0.045+0.095 = 0.14
rN	0.005+0.855 = 0.86

Probabilities of incorrect reports:

False positive: $\Pr(N|rD)$ 0.095/0.14 = 0.6786 = 68%

False negative: $\Pr(D|rN)$ 0.005/0.86 = 0.0058 = 0.6%

Under- and overtreatment:

Reports per 100,000 tests:

State	Report	Probability	Per 100,000
D	rD	0.05*0.9 =0.045	4,500
D	rN	0.05*0.1 =0.005	500
N	rD	0.95*0.1 =0.095	9,500
N	rN	0.95*0.9 =0.855	85,500

- Undertreat: 500
- Overtreat: 9,500