

**eTable 11.** Identification of colocalized loci by multi-trait colocalization using HyPrColoc

Locus	Trait	PP	RP	Candidate SNP	PP.SNP	Nearest gene	CHR	POS	A1	A2	Functional annotation	CADD	RDB
123	AST, COPD	0.8795	0.9792	rs10519237	0.0875	RP11-353B9.1	15	49956672	T	C	intergenic	0.836	7
17	AST, COPD	0.8803	0.9905	rs11679146	0.5024	IL18R1	2	103009412	G	A	intronic	6.566	6
152	AST, COPD	0.8296	0.9075	rs11697152	0.5447	RP5-984P4.1	20	21467208	G	A	intergenic	0.159	7
73	AST, COPD, IPF	0.7547	0.7705	rs147678978	1	AC006326.3	7	116909572	T	G	intergenic	5.336	2b
139	IPF, SNO	0.8976	0.9997	rs150592114	0.8497	RP11-259G18.3	17	44333331	G	A	intergenic	3.04	6
135	AST, SNO	0.7869	0.8502	rs1641512	0.3948	ATP1B2	17	7559462	G	A	3PRIME_UTR	0.717	0.5139
90	AST, COPD	0.7508	0.9363	rs1775554	0.1891	RP11-428L9.2	10	9054340	C	A	intergenic	5.711	3a
131	AST, SNO	0.859	0.9999	rs2199036	0.0876	STX1B	16	31006972	T	C	intronic	0.585	7
119	COPD, IPF	0.7106	0.7501	rs28929474	0.945	SERPINA1	14	94844947	T	C	exonic	20.2	NA
5	AST, COPD, LC	0.8111	0.8424	rs34517439	0.997	DNAJB4:GIPC2	1	78450517	A	C	intronic	8.996	6
86	AST, COPD	0.7026	0.8262	rs3808868	0.1227	GALT:IL11RA	9	34654142	G	T	intronic	5.099	NA
77	COPD, LC	0.8069	0.9971	rs56223946	0.4368	GULOP	8	27413986	T	C	intergenic	1.227	6
45	AST, COPD	0.864	0.9736	rs9292907	0.1985	FGF10-AS1	5	44428516	G	A	intergenic	5.311	6
57	AST, COPD	0.9687	0.9803	rs9350191	0.9487	ID4	6	19842661	T	C	intergenic	12.57	3a
132	AST, SNO	0.8761	1	rs9940278	0.0766	FTO	16	53800200	T	C	intronic	0.187	6

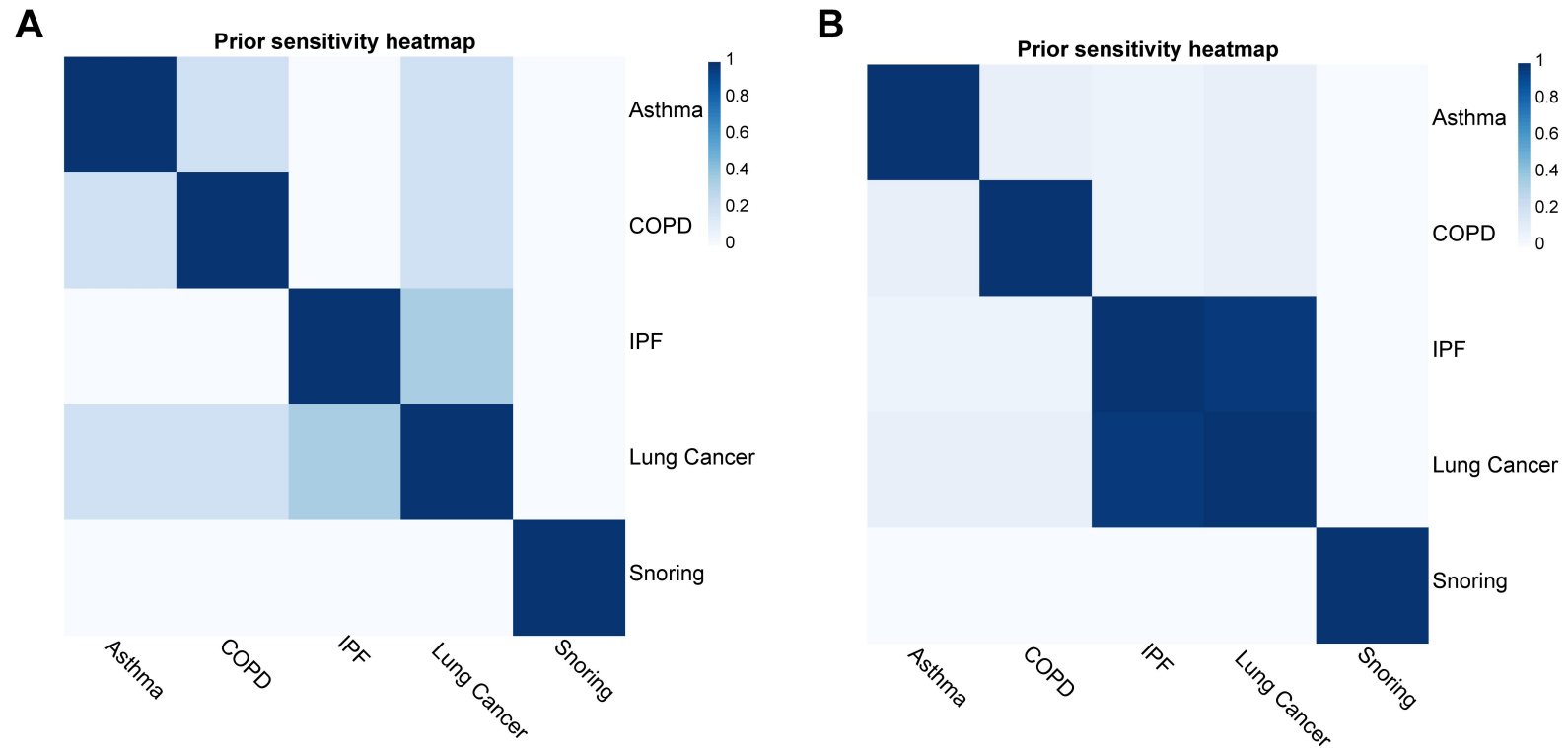
Abbreviations: HyPrColoc, Hypothesis Prioritisation for multi-trait Colocalization; Locus No., the numerical order of pleiotropic genomic risk locus; A1, effect allele; A2, non effect allele; PP, posterior probability; RP, Regional probability; CHR, chromosome; BP, base pair; CADD, Combined Annotation-Dependent depletion scores; RDB, RegulomeDB scores; AST, Asthma; COPD, Chronic obstructive pulmonary disease; IPF, Idiopathic Pulmonary Fibrosis; LC, Lung Cancer; SNO, Snoring.

**\*\*Sensitivity analysis of the colocalization loci**

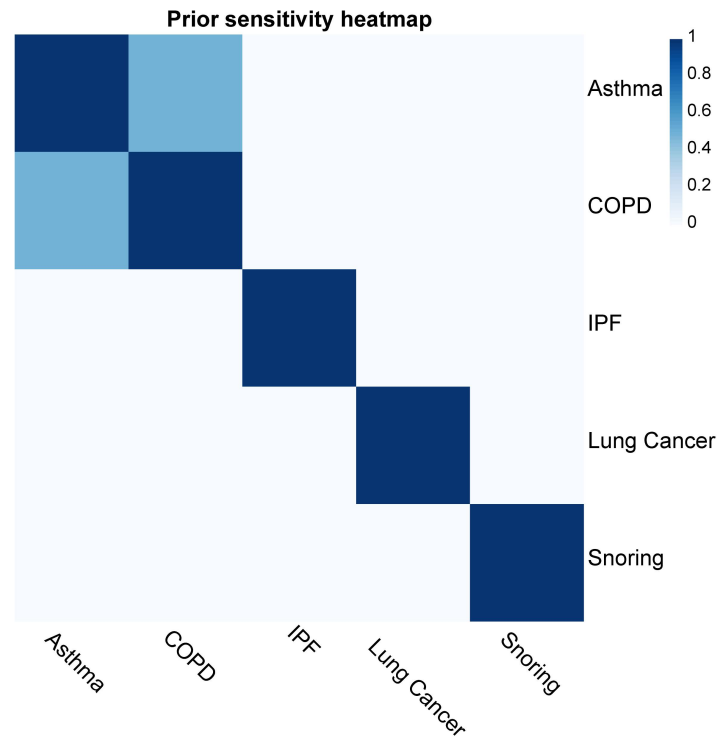
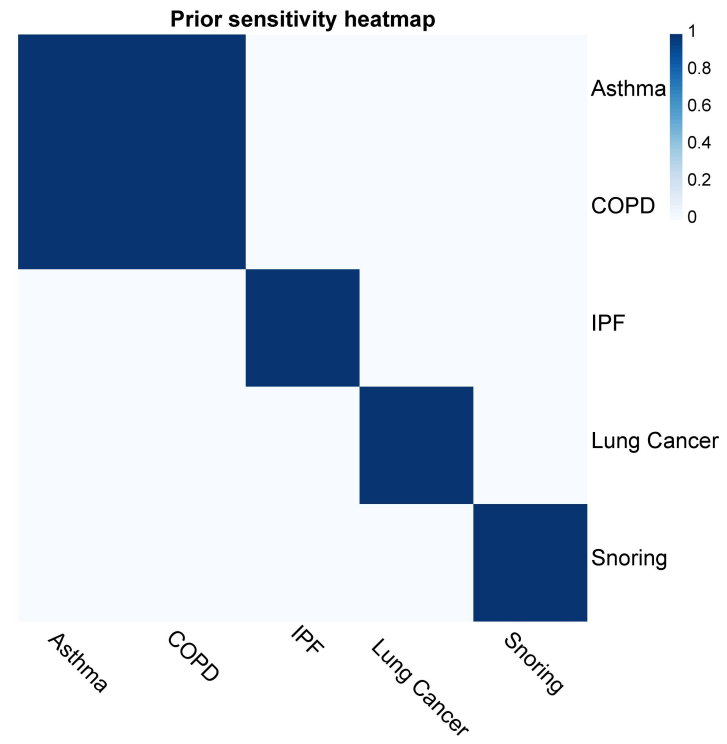
We performed sensitivity analysis on colocalized loci using heat-maps and similarity matrices generated from two different prior probabilities.

①Heat-map (A: prior probability= $1 \times 10^{-4}$ ; B: prior probability= $1 \times 10^{-5}$ )

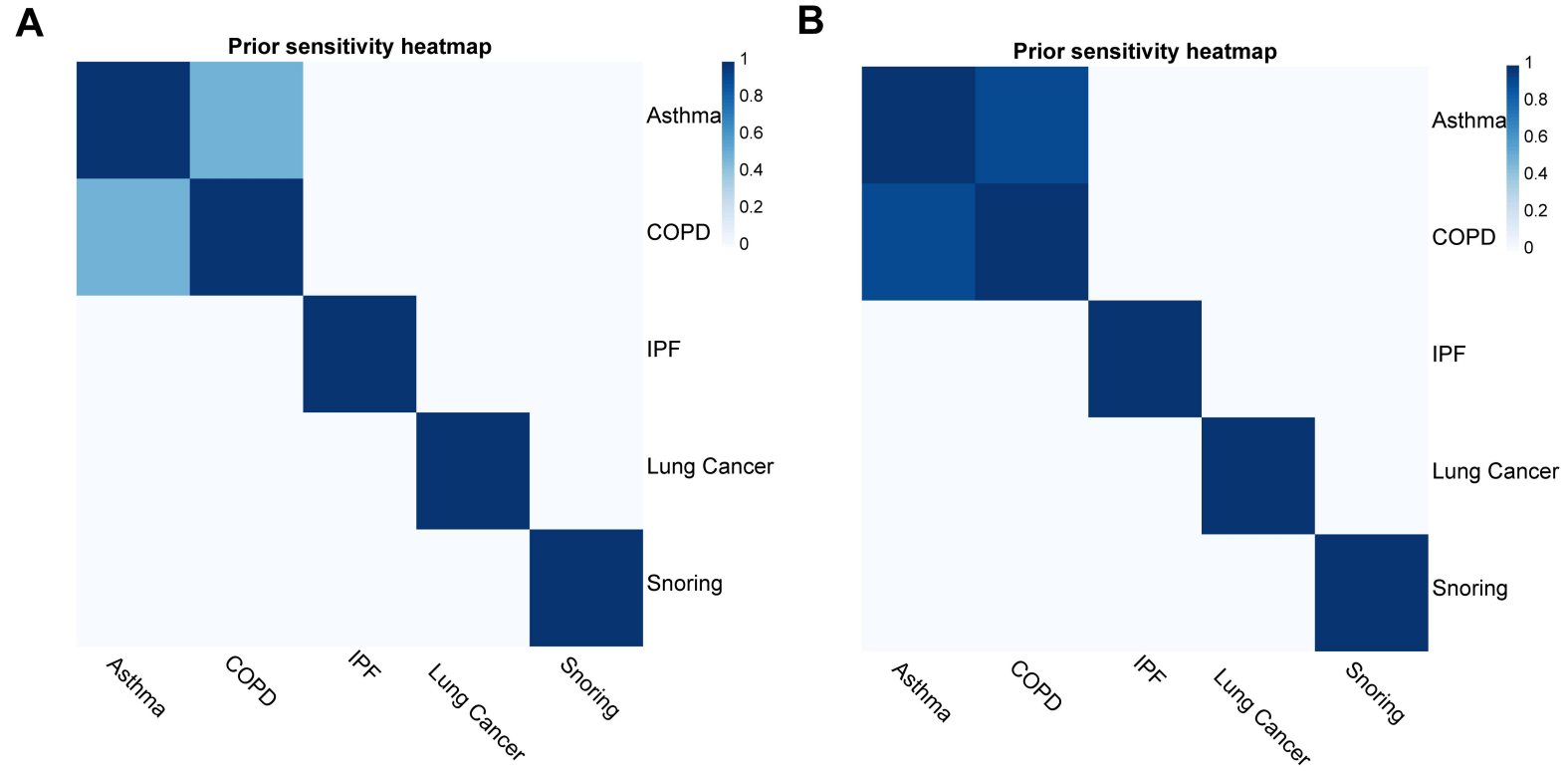
Loci 5:



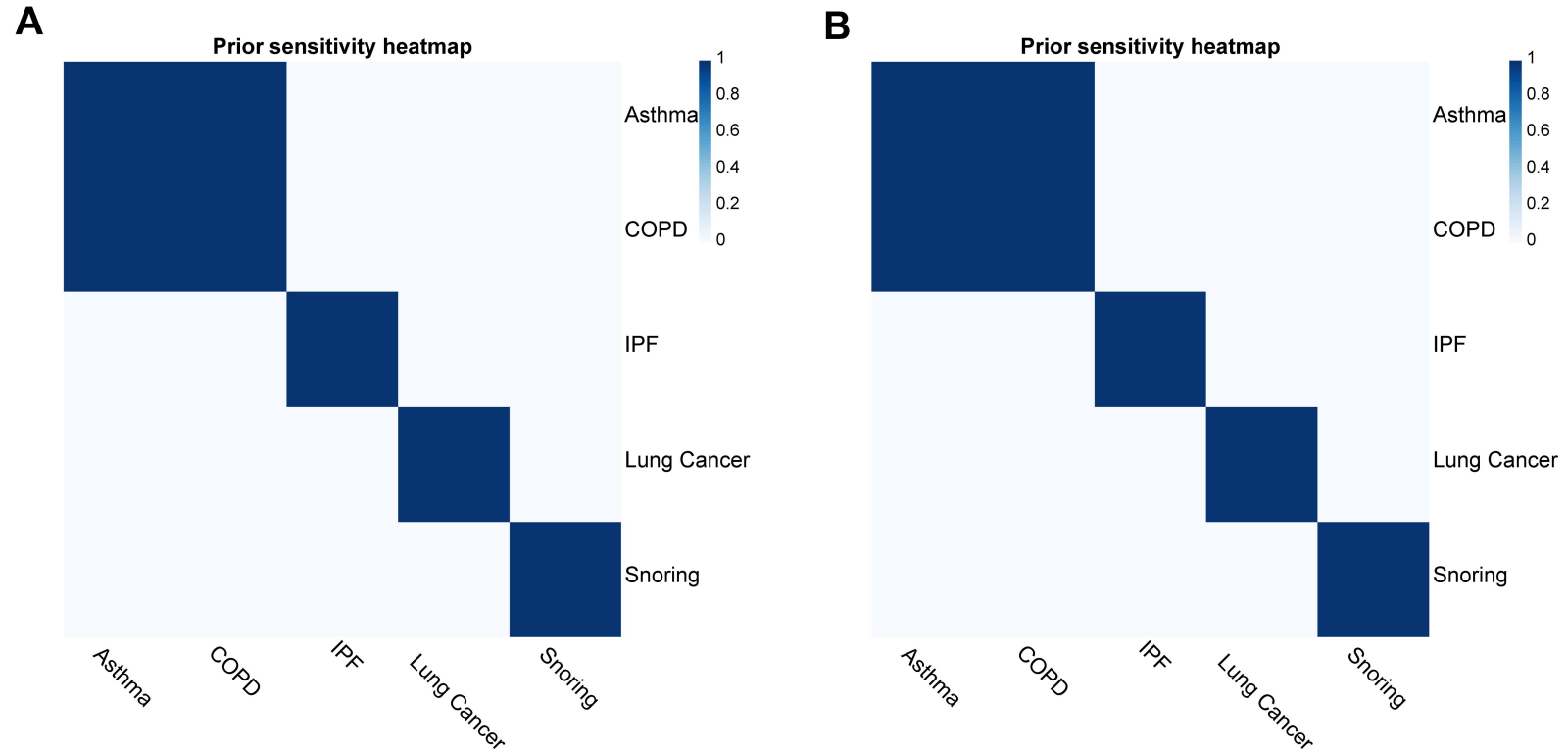
Loci 17:

**A****B**

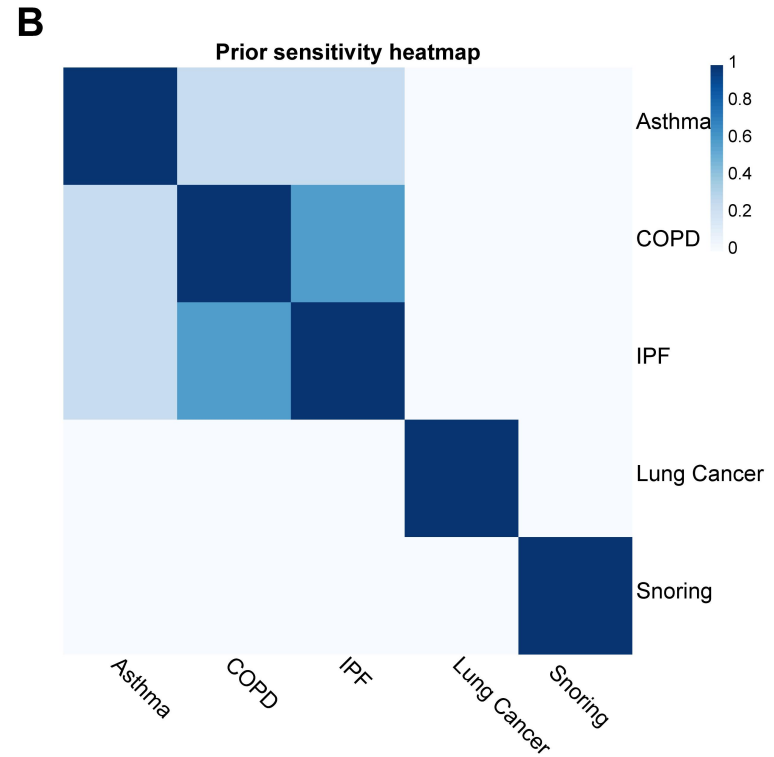
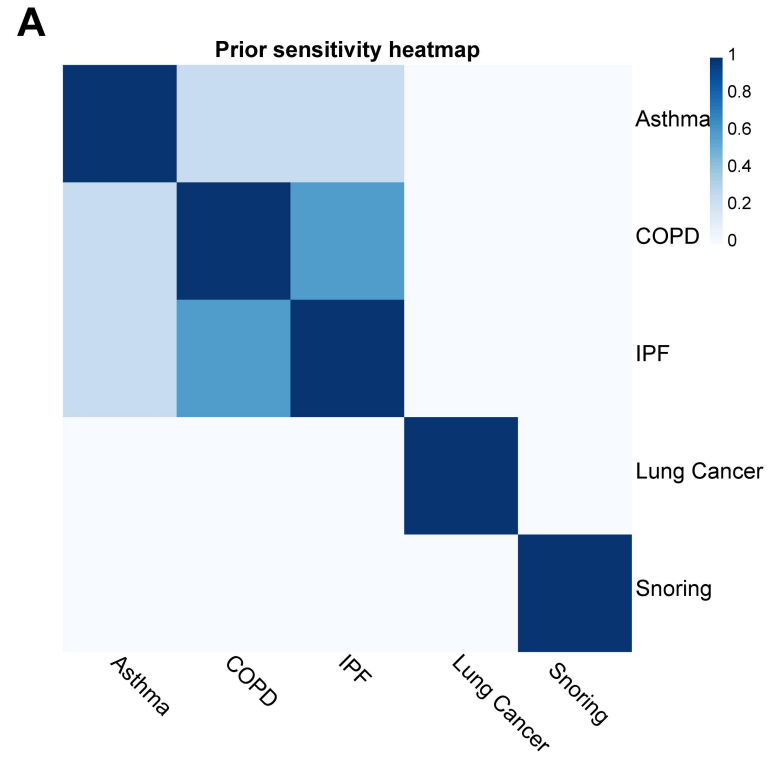
Loci 45:



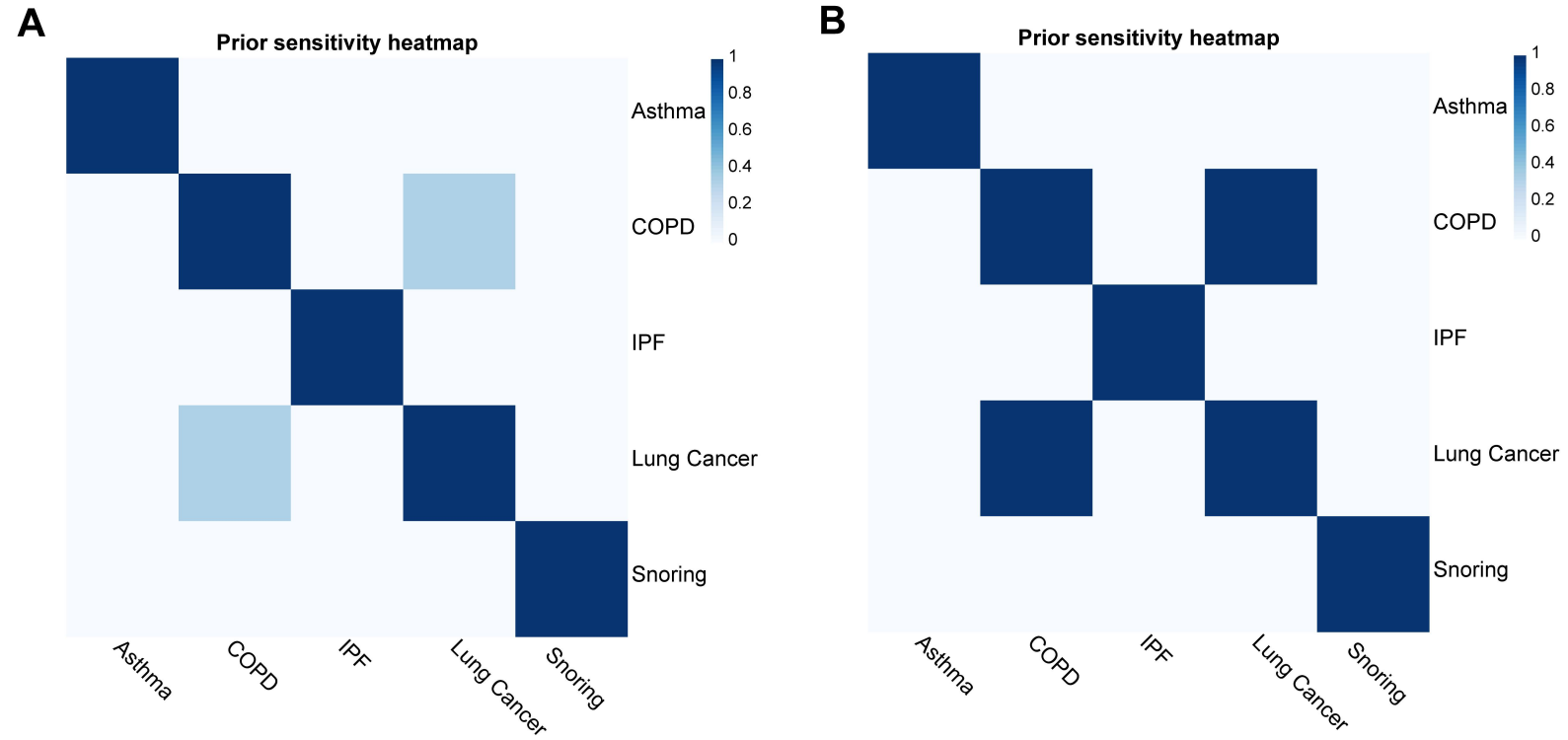
Loci 57:



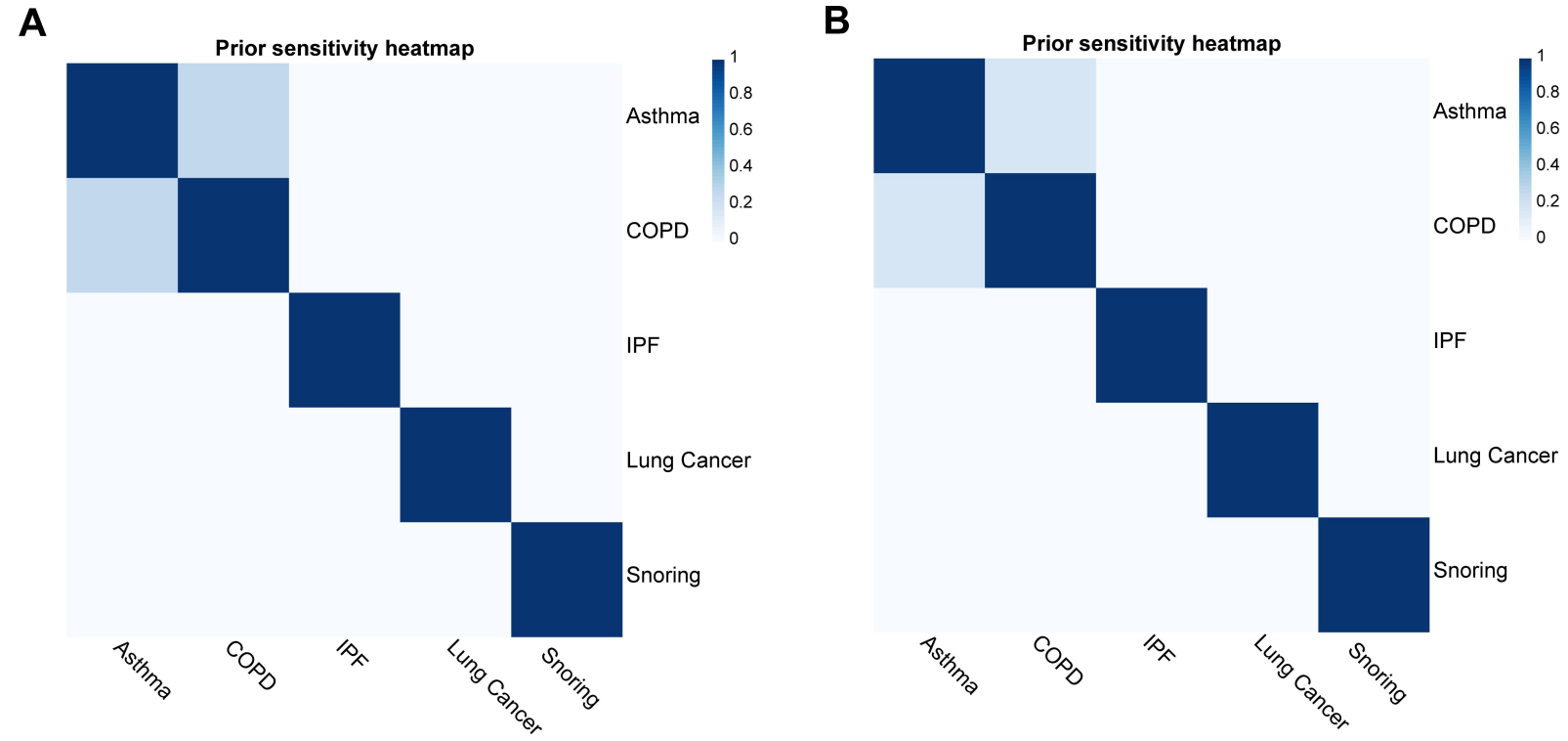
Loci 73:



Loci 77:

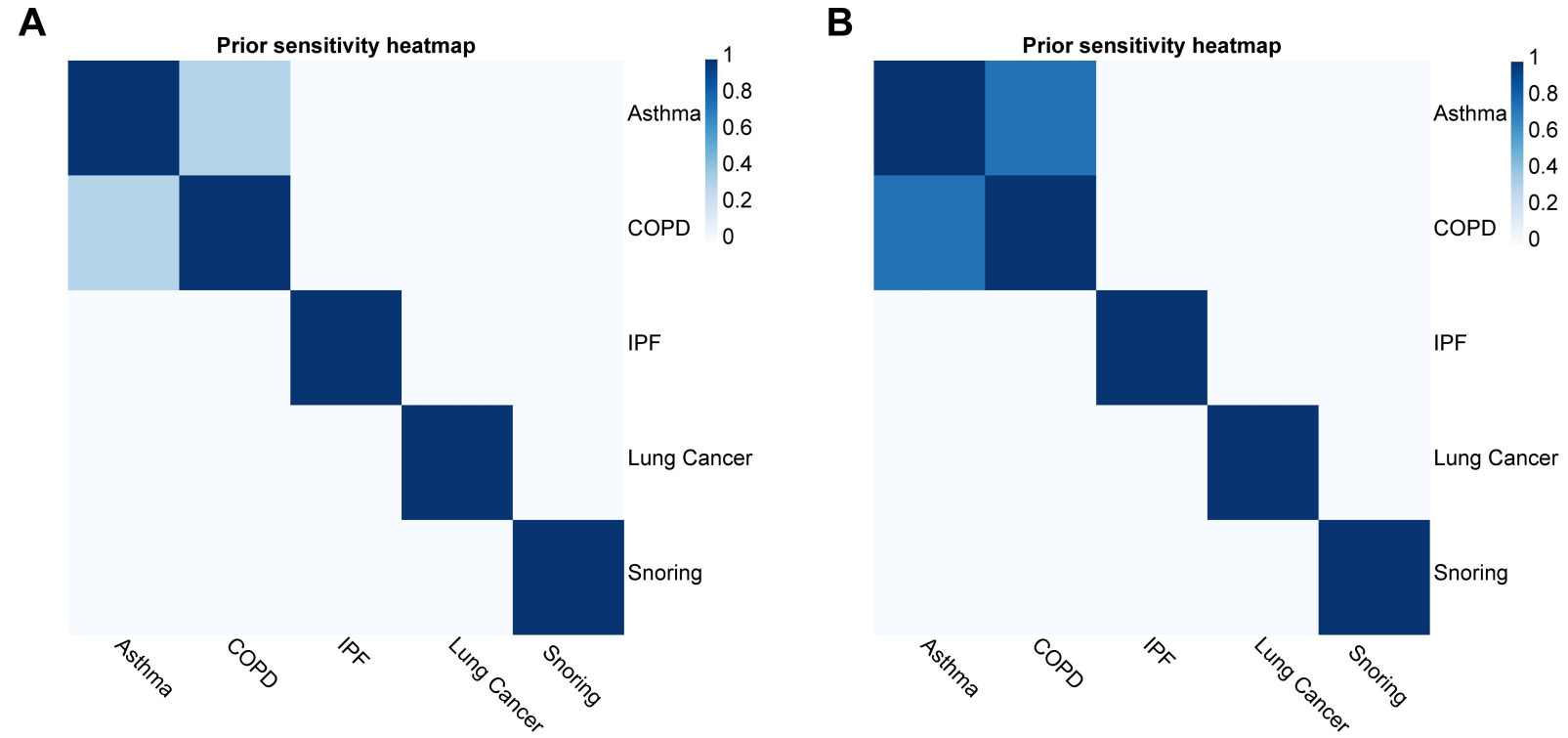


Loci 86:

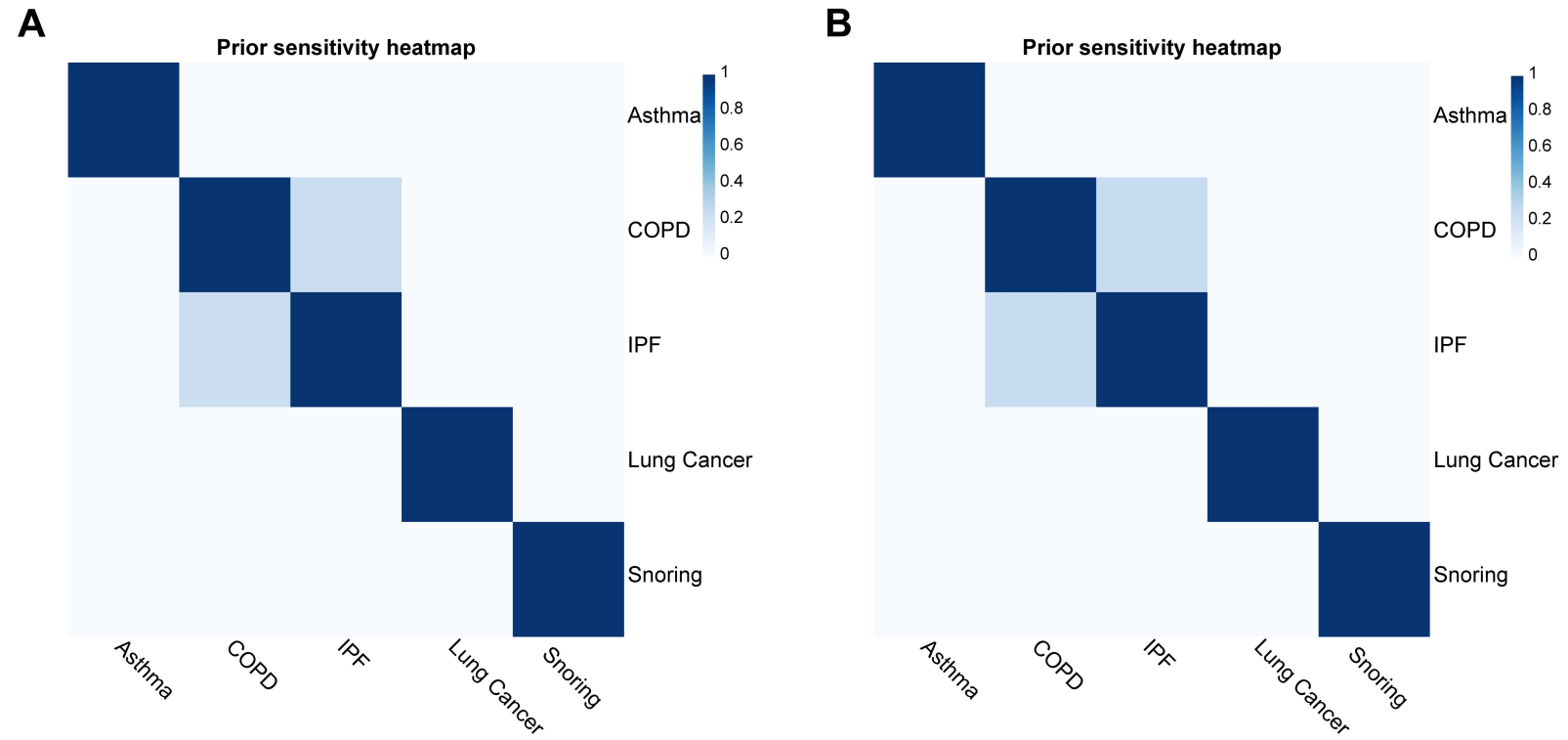




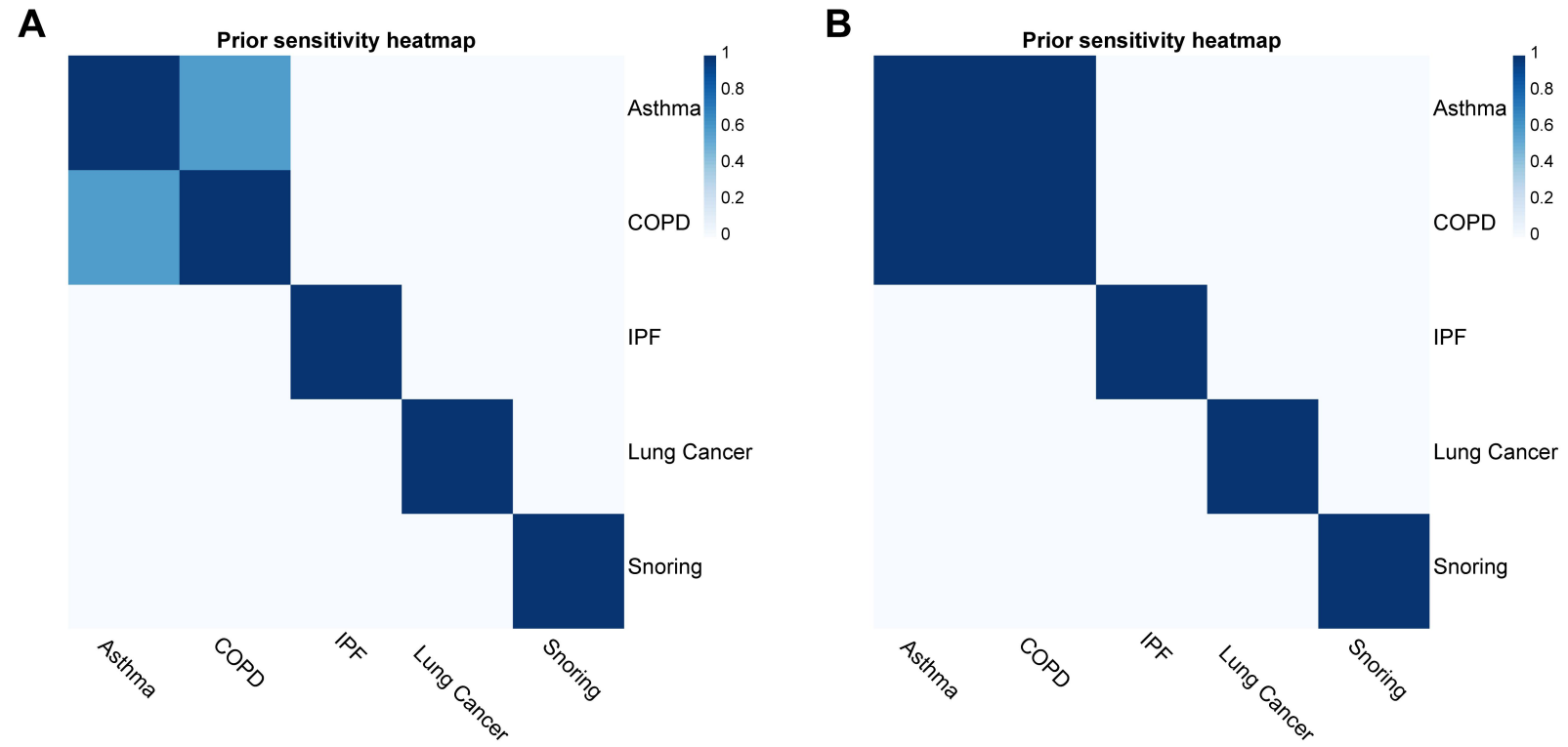
Loci 90:



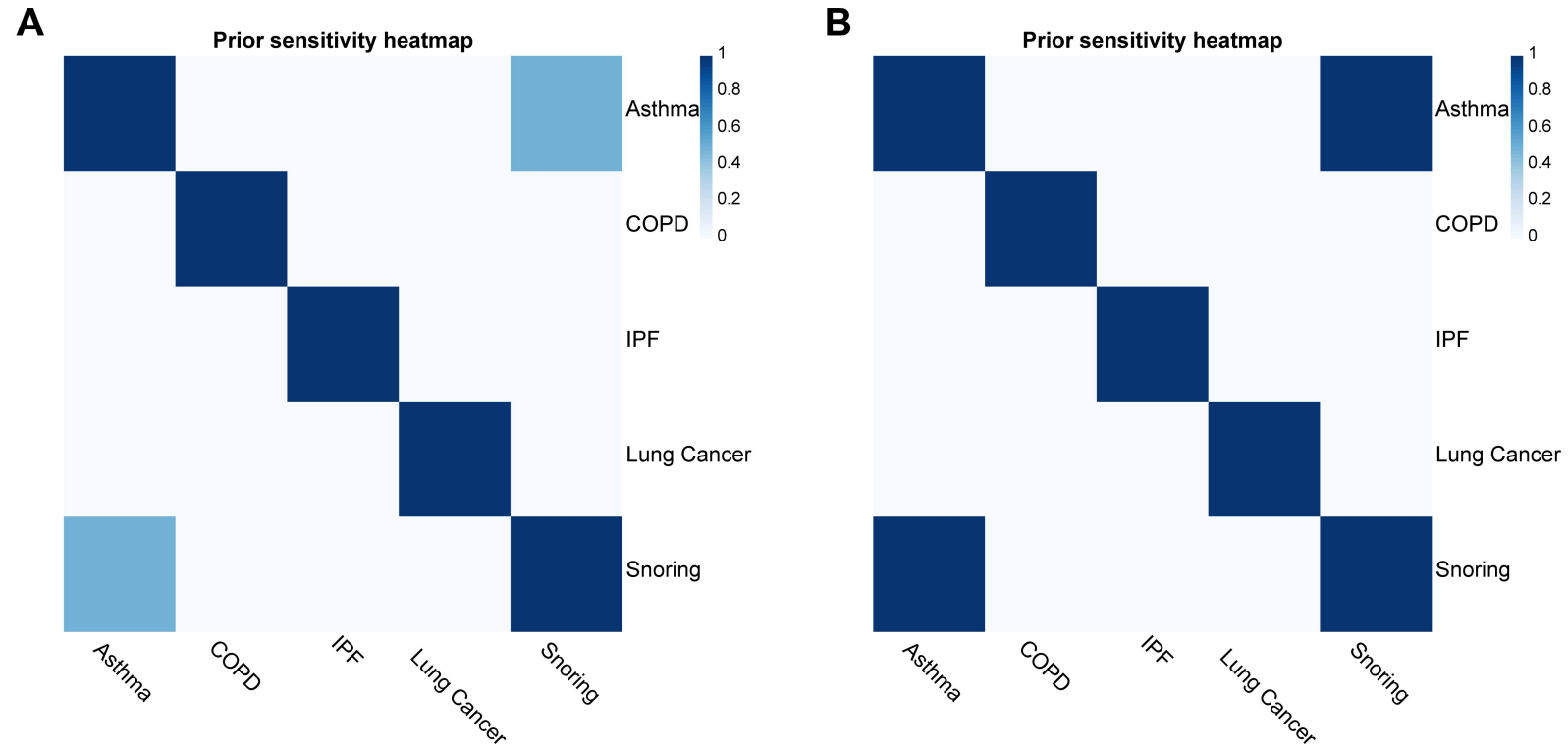
Loci 119:



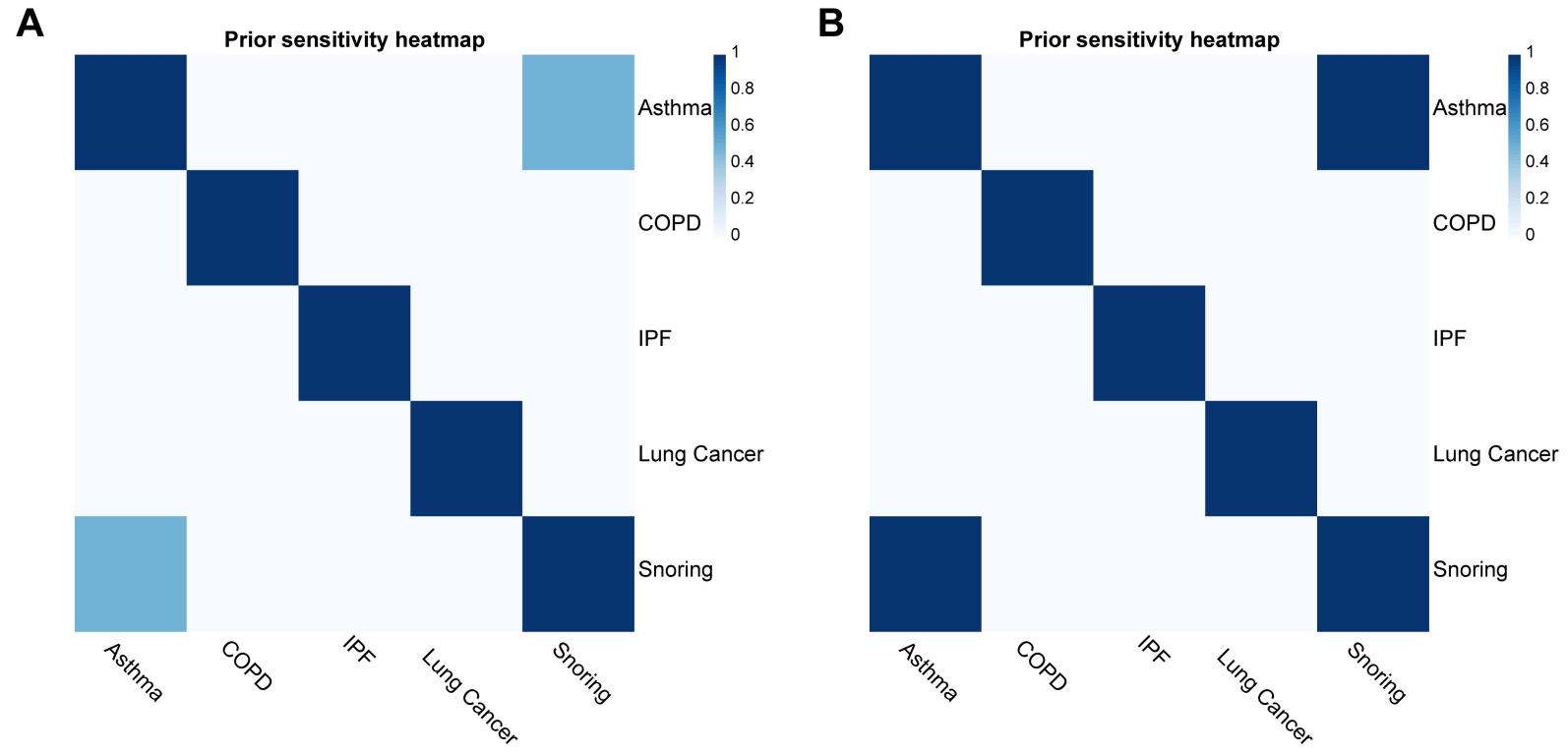
Loci 123:



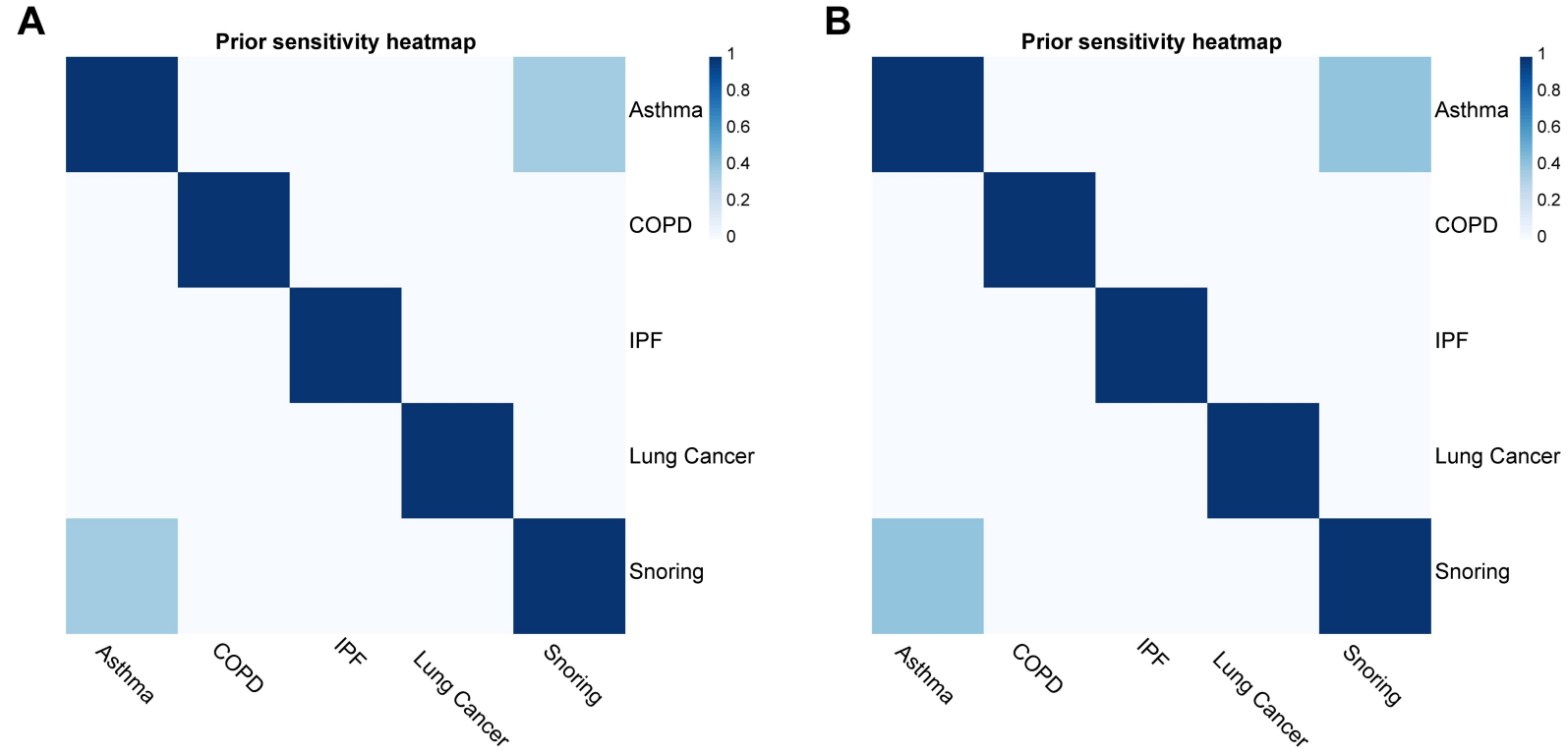
Loci 131:



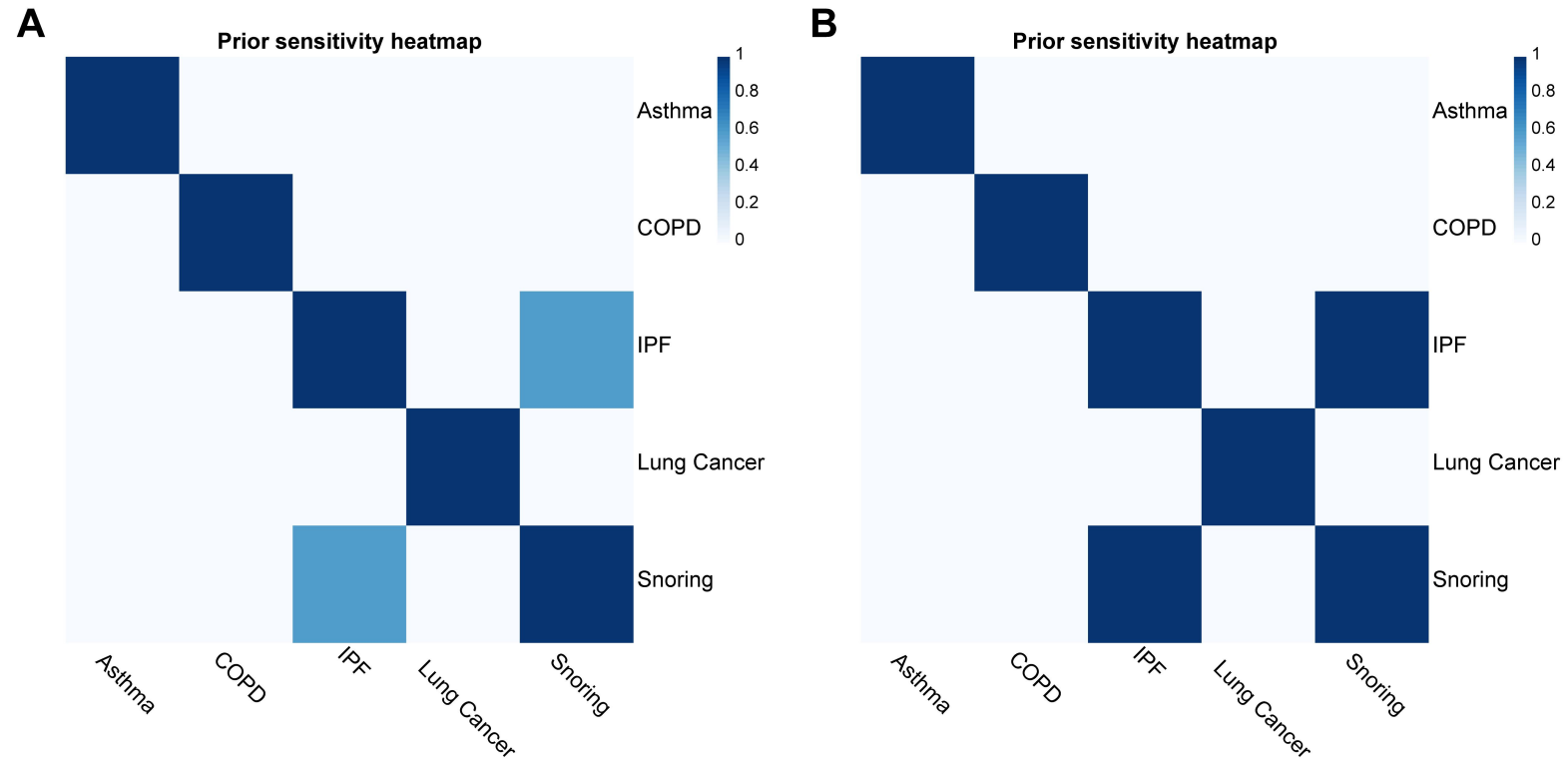
Loci 132:



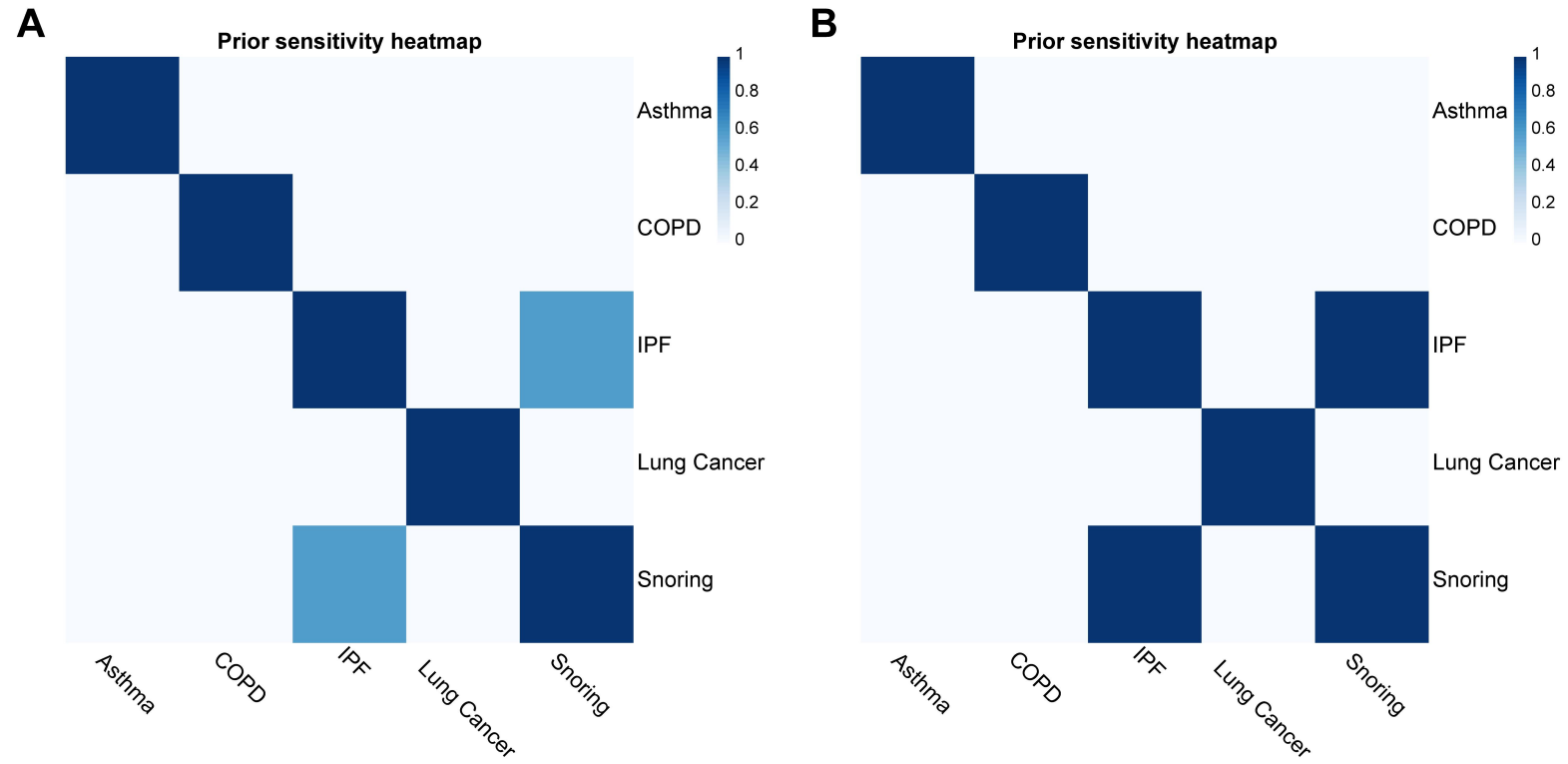
Loci 135:



Loci 139:



Loci 152:





② Similarity matrix (A: prior probability= $1 \times 10^{-4}$ ; B: prior probability= $1 \times 10^{-5}$ )

Loci 5:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.21	0.00	0.21	0.00
T2	0.21	1.00	0.00	0.21	0.00
T3	0.00	0.00	1.00	0.35	0.00
T4	0.21	0.21	0.35	1.00	0.00
T5	0.00	0.00	0.00	1.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.08	0.06	0.08	0.00
T2	0.08	1.00	0.06	0.08	0.00
T3	0.06	0.06	1.00	0.98	0.00
T4	0.08	0.08	0.98	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

Loci 17:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.50	0.00	0.00	0.00
T2	0.50	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	1.00	0.00	0.00	0.00
T2	1.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

Loci 45:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.50	0.00	0.00	0.00
T2	0.50	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.92	0.00	0.00	0.00
T2	0.92	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

Loci 57:

A:

	T1	T2	T3	T4	T5
T1	1.00	1.00	0.00	0.00	0.00
T2	1.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	1.00	0.00	0.00	0.00
T2	1.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

Loci 73:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.25	0.25	0.00	0.00
T2	0.25	1.00	0.58	0.00	0.00
T3	0.25	0.58	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.25	0.25	0.00	0.00
T2	0.25	1.00	0.58	0.00	0.00
T3	0.25	0.58	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

Loci 77:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	0.00
T2	0.00	1.00	0.00	0.33	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.33	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	0.00
T2	0.00	1.00	0.00	1.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	1.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

Loci 86:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.27	0.00	0.00	0.00
T2	0.27	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.17	0.00	0.00	0.00
T2	0.17	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

Loci 90:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.31	0.00	0.00	0.00
T2	0.31	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.75	0.00	0.00	0.00
T2	0.75	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00



Loci 119:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	0.00
T2	0.00	1.00	0.23	0.00	0.00
T3	0.00	0.23	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	0.00
T2	0.00	1.00	0.25	0.00	0.00
T3	0.00	0.25	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

Loci 123:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.58	0.00	0.00	0.00
T2	0.58	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	1.00	0.00	0.00	0.00
T2	1.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

Loci 131:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	0.50
T2	0.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.50	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	1.00
T2	0.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	1.00	0.00	0.00	0.00	1.00

Loci 132:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	0.50
T2	0.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.50	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	1.00
T2	0.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	1.00	0.00	0.00	0.00	1.00

Loci 135:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	0.38
T2	0.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.38	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	0.42
T2	0.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.42	0.00	0.00	0.00	1.00

Loci 139:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	0.00
T2	0.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.58
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.58	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.00	0.00	0.00	0.00
T2	0.00	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	1.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	1.00	0.00	1.00

Loci 152:

A:

	T1	T2	T3	T4	T5
T1	1.00	0.60	0.00	0.00	0.00
T2	0.60	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00

B:

	T1	T2	T3	T4	T5
T1	1.00	0.50	0.00	0.00	0.00
T2	0.50	1.00	0.00	0.00	0.00
T3	0.00	0.00	1.00	0.00	0.00
T4	0.00	0.00	0.00	1.00	0.00
T5	0.00	0.00	0.00	0.00	1.00