

Annex 2 O/E ratio of all binary and triads comorbidities pattern present in participants

Rank	binary comorbidities pattern	O/E ratio
1	Chronic lung diseases and Asthma	161.00
2	Emotional, nervous, or psychiatric problems and Memory-related disease	98.57
3	Dyslipidemia and Diabetes or high blood sugar	38.69
4	Heart disease and Memory-related disease	25.96
5	Stroke and Memory-related disease	24.19
6	Hypertension and Stroke	23.10
7	Hypertension and Diabetes or high blood sugar	20.77
8	Cancer or malignant tumor and Stroke	19.71
9	Memory-related disease and Asthma	19.71
10	Stroke and Asthma	19.71
11	Hypertension and Heart disease	19.07
12	Hypertension and Dyslipidemia	18.98
13	Dyslipidemia and Heart disease	17.39
14	Diabetes or high blood sugar and Heart disease	14.87
15	Diabetes or high blood sugar and Liver disease	14.40
16	Cancer or malignant tumor and Liver disease	13.65
17	Diabetes or high blood sugar and Kidney disease	13.38
18	Hypertension and Memory-related disease	13.33
19	Dyslipidemia and Cancer or malignant tumor	12.51
20	Stomach or other digestive disease and Arthritis or rheumatism	10.80
21	Liver disease and Heart disease	10.49
22	Dyslipidemia and Stroke	10.23
23	Dyslipidemia and Stomach or other digestive disease	9.81
24	Dyslipidemia and Kidney disease	9.61
25	Chronic lung diseases and Memory-related disease	9.56
26	Chronic lung diseases and Stroke	9.56
27	Kidney disease and Arthritis or rheumatism	9.42
28	Heart disease and Kidney disease	9.29
29	Chronic lung diseases and Heart disease	9.12
30	Stomach or other digestive disease and Asthma	9.03
31	Liver disease and Kidney disease	8.99
32	Kidney disease and Stomach or other digestive disease	8.92
33	Memory-related disease and Arthritis or rheumatism	8.89
34	Stroke and Arthritis or rheumatism	8.89
35	Arthritis or rheumatism and Asthma	8.77
36	Liver disease and Memory-related disease	8.38
37	Diabetes or high blood sugar and Memory-related disease	8.32
38	Diabetes or high blood sugar and Stroke	8.32
39	Chronic lung diseases and Arthritis or rheumatism	8.14
40	Heart disease and Stomach or other digestive disease	8.11

41	Heart disease and Arthritis or rheumatism	7.45
42	Stomach or other digestive disease and Emotional, nervous, or psychiatric problems	7.39
43	Liver disease and Stomach or other digestive disease	7.33
44	Diabetes or high blood sugar and Cancer or malignant tumor	6.78
45	Diabetes or high blood sugar and Asthma	6.78
46	Diabetes or high blood sugar and Arthritis or rheumatism	6.44
47	Liver disease and Arthritis or rheumatism	6.16
48	Chronic lung diseases and Kidney disease	5.98
49	Chronic lung diseases and Stomach or other digestive disease	5.97
50	Hypertension and Arthritis or rheumatism	5.74
51	Chronic lung diseases and Liver disease	5.52
52	Kidney disease and Emotional, nervous, or psychiatric problems	5.29
53	Kidney disease and Asthma	5.29
54	Chronic lung diseases and Emotional, nervous, or psychiatric problems	5.19
55	Dyslipidemia and Memory-related disease	5.12
56	Hypertension and Emotional, nervous, or psychiatric problems	5.07
57	Hypertension and Chronic lung diseases	5.03
58	Hypertension and Kidney disease	5.01
59	Cancer or malignant tumor and Arthritis or rheumatism	4.96
60	Cancer or malignant tumor and Stomach or other digestive disease	4.93
61	Dyslipidemia and Arthritis or rheumatism	4.75
62	Hypertension and Liver disease	4.61
63	Diabetes or high blood sugar and Chronic lung diseases	4.38
64	Heart disease and Stroke	4.33
65	Dyslipidemia and Asthma	4.17
66	Hypertension and Stomach or other digestive disease	3.85
67	Cancer or malignant tumor and Heart disease	3.53
68	Heart disease and Asthma	3.53
69	Emotional, nervous, or psychiatric problems and Arthritis or rheumatism	3.43
70	Diabetes or high blood sugar and Stomach or other digestive disease	3.12
71	Hypertension and Cancer or malignant tumor	2.17
72	Hypertension and Asthma	2.17
73	Stomach or other digestive disease and Memory-related disease	2.02
74	Stroke and Stomach or other digestive disease	2.02
75	Dyslipidemia and Liver disease	1.77
76	Dyslipidemia and Chronic lung diseases	1.35

Rank	triads comorbidities pattern	O/E ratio
1	Stroke, Emotional, nervous, or psychiatric problems and Memory-related disease	10491.60
2	Emotional, nervous, or psychiatric problems, Memory-related disease, Asthma,	8548.88
3	Heart disease, Stroke and Memory-related disease	2302.62
4	Chronic lung diseases, Emotional, nervous, or psychiatric problems and Asthma	2252.13
5	Chronic lung diseases, Heart disease, Asthma,	1977.13
6	Dyslipidemia, Heart disease and Memory-related disease	1461.04
7	Hypertension, Stroke and Memory-related disease	1418.54
8	Hypertension, Dyslipidemia and Diabetes or high blood sugar	1409.29
9	Chronic lung diseases, Memory-related disease and Asthma	1381.96
10	Chronic lung diseases, Arthritis or rheumatism and Asthma	1256.63
11	Dyslipidemia, Diabetes or high blood sugar and Kidney disease	1255.51
12	Cancer or malignant tumor, Chronic lung diseases and Asthma	1126.07
13	Chronic lung diseases, Kidney disease and Asthma	1112.24
14	Liver disease, Kidney disease and Asthma	974.52
15	Dyslipidemia, Diabetes or high blood sugar and Liver disease	972.21
16	Chronic lung diseases, Liver disease and Asthma	956.96
17	Dyslipidemia, Diabetes or high blood sugar and Stroke	935.99
18	Chronic lung diseases, Stomach or other digestive disease and Asthma	921.21
19	Hypertension, Dyslipidemia and Heart disease	876.36
20	Diabetes or high blood sugar, Liver disease and Kidney disease	822.11
21	Hypertension, Diabetes or high blood sugar and Stroke	812.58
22	Hypertension, Chronic lung diseases and Asthma	812.01
23	Hypertension, Dyslipidemia and Stroke	800.07
24	Dyslipidemia, Heart disease and Asthma	793.67
25	Diabetes or high blood sugar, Heart disease and Stroke	791.41
26	Hypertension, Emotional, nervous, or psychiatric problems and Memory-related disease	770.58
27	Dyslipidemia, Diabetes or high blood sugar and Cancer or malignant tumor	762.67
28	Dyslipidemia, Diabetes or high blood sugar and Emotional, nervous, or psychiatric problems	762.67
29	Dyslipidemia, Diabetes or high blood sugar and Heart disease	669.54
30	Liver disease, Heart disease and Emotional, nervous, or psychiatric problems	649.62
31	Heart disease, Kidney disease and Memory-related disease	617.74
32	Heart disease, Stroke and Kidney disease	617.74
33	Dyslipidemia, Chronic lung diseases and Asthma	584.58
34	Diabetes or high blood sugar, Liver disease and Heart disease	548.02

35	Hypertension, Diabetes or high blood sugar and Heart disease	523.14
36	Hypertension, Heart disease and Stroke	507.36
37	Diabetes or high blood sugar, Chronic lung diseases and Asthma	474.98
38	Liver disease, Stomach or other digestive disease and Asthma	454.02
39	Stomach or other digestive disease, Emotional, nervous, or psychiatric problems and Memory-related disease	437.10
40	Hypertension, Memory-related disease, Asthma,	385.29
41	Diabetes or high blood sugar, Stomach or other digestive disease and Asthma	300.46
42	Hypertension, Dyslipidemia and Memory-related disease	300.03
43	Liver disease, Kidney disease and Arthritis or rheumatism	277.66
44	Hypertension, Heart disease and Memory-related disease	253.68
45	Dyslipidemia, Liver disease and Kidney disease	252.95
46	Hypertension, Chronic lung diseases and Stroke	249.13
47	Stroke, Memory-related disease and Arthritis or rheumatism	249.11
48	Dyslipidemia, Chronic lung diseases and Liver disease	248.40
49	Cancer or malignant tumor, Chronic lung diseases and Heart disease	247.14
50	Chronic lung diseases, Heart disease and Emotional, nervous, or psychiatric problems	247.14
51	Hypertension, Dyslipidemia and Asthma	244.47
52	Cancer or malignant tumor, Heart disease and Stomach or other digestive disease	234.50
53	Chronic lung diseases, Memory-related disease and Arthritis or rheumatism	229.69
54	Chronic lung diseases, Stroke and Stomach or other digestive disease	211.98
55	Hypertension, Stroke and Arthritis or rheumatism	210.41
56	Chronic lung diseases, Liver disease and Heart disease	210.03
57	Hypertension, Cancer or malignant tumor and Heart disease	206.71
58	Hypertension, Heart disease and Emotional, nervous, or psychiatric problems	206.71
59	Memory-related disease, Arthritis or rheumatism and Asthma	202.98
60	Emotional, nervous, or psychiatric problems, Memory-related disease and Arthritis or rheumatism	202.98
61	Stroke, Emotional, nervous, or psychiatric problems and Arthritis or rheumatism	202.98
62	Stroke, Kidney disease and Arthritis or rheumatism	200.49
63	Dyslipidemia, Diabetes or high blood sugar and Stomach or other digestive disease	194.98
64	Liver disease, Stomach or other digestive disease and Memory-related disease	185.73
65	Dyslipidemia, Stomach or other digestive disease and Asthma	184.90
66	Diabetes or high blood sugar, Stomach or other digestive disease and Memory-related disease	184.37
67	Diabetes or high blood sugar, Heart disease and Arthritis or rheumatism	183.74

68	Chronic lung diseases, Stroke and Arthritis or rheumatism	164.06
69	Kidney disease, Arthritis or rheumatism and Asthma	163.36
70	Dyslipidemia, Diabetes or high blood sugar and Arthritis or rheumatism	162.98
71	Hypertension, Diabetes or high blood sugar and Memory-related disease	162.52
72	Hypertension, Dyslipidemia and Kidney disease	160.98
73	Hypertension, Heart disease and Kidney disease	158.80
74	Chronic lung diseases, Liver disease and Kidney disease	157.53
75	Dyslipidemia, Liver disease and Stomach or other digestive disease	157.13
76	Heart disease, Kidney disease and Stomach or other digestive disease	154.42
77	Cancer or malignant tumor, Liver disease and Stomach or other digestive disease	151.34
78	Liver disease, Stomach or other digestive disease and Emotional, nervous, or psychiatric problems	151.34
79	Heart disease, Arthritis or rheumatism and Asthma	145.20
80	Stroke, Kidney disease and Stomach or other digestive disease	143.91
81	Liver disease, Emotional, nervous, or psychiatric problems and Arthritis or rheumatism	140.56
82	Diabetes or high blood sugar, Arthritis or rheumatism and Asthma	139.53
83	Hypertension, Dyslipidemia and Liver disease	138.50
84	Hypertension, Heart disease and Asthma	137.80
85	Kidney disease, Stomach or other digestive disease and Arthritis or rheumatism	136.43
86	Chronic lung diseases, Emotional, nervous, or psychiatric problems and Arthritis or rheumatism	133.68
87	Hypertension, Liver disease and Asthma	133.40
88	Hypertension, Diabetes or high blood sugar and Cancer or malignant tumor	132.42
89	Chronic lung diseases, Stomach or other digestive disease and Arthritis or rheumatism	131.24
90	Hypertension, Diabetes or high blood sugar and Kidney disease	130.80
91	Heart disease, Stomach or other digestive disease and Arthritis or rheumatism	128.06
92	Dyslipidemia, Heart disease and Stomach or other digestive disease	121.74
93	Hypertension, Heart disease and Arthritis or rheumatism	121.06
94	Stomach or other digestive disease, Arthritis or rheumatism and Asthma	118.39
95	Chronic lung diseases, Heart disease and Arthritis or rheumatism	117.36
96	Hypertension, Liver disease and Heart disease	117.11
97	Diabetes or high blood sugar, Kidney disease and Arthritis or rheumatism	114.85
98	Chronic lung diseases, Heart disease and Stomach or other digestive disease	113.73
99	Hypertension, Diabetes or high blood sugar and Liver disease	112.54
100	Diabetes or high blood sugar, Chronic lung diseases and Heart disease	104.24
101	Liver disease, Stomach or other digestive disease and Arthritis or rheumatism	104.21
102	Stroke, Stomach or other digestive disease and Arthritis or rheumatism	103.78

103	Hypertension, Kidney disease and Emotional, nervous, or psychiatric problems	103.36
104	Chronic lung diseases, Liver disease and Arthritis or rheumatism	102.25
105	Hypertension, Dyslipidemia and Arthritis or rheumatism	100.61
106	Liver disease, Kidney disease and Stomach or other digestive disease	99.65
107	Dyslipidemia, Cancer or malignant tumor and Stomach or other digestive disease	92.45
108	Dyslipidemia, Stomach or other digestive disease and Emotional, nervous, or psychiatric problems	92.45
109	Hypertension, Dyslipidemia and Chronic lung diseases	92.21
110	Hypertension, Chronic lung diseases and Heart disease	89.11
111	Heart disease, Stroke and Arthritis or rheumatism	89.10
112	Hypertension, Heart disease and Stomach or other digestive disease	88.07
113	Chronic lung diseases, Heart disease and Kidney disease	81.37
114	Chronic lung diseases, Kidney disease and Arthritis or rheumatism	79.23
115	Diabetes or high blood sugar, Chronic lung diseases and Arthritis or rheumatism	78.94
116	Chronic lung diseases, Kidney disease and Stomach or other digestive disease	75.82
117	Hypertension, Diabetes or high blood sugar and Arthritis or rheumatism	75.46
118	Hypertension, Dyslipidemia and Stomach or other digestive disease	75.00
119	Chronic lung diseases, Liver disease and Stomach or other digestive disease	73.39
120	Hypertension, Memory-related disease and Arthritis or rheumatism	73.19
121	Stomach or other digestive disease, Memory-related disease and Arthritis or rheumatism	72.65
122	Heart disease, Kidney disease and Arthritis or rheumatism	71.71
123	Liver disease, Arthritis or rheumatism and Asthma	70.28
124	Diabetes or high blood sugar, Cancer or malignant tumor and Arthritis or rheumatism	69.76
125	Kidney disease, Memory-related disease and Arthritis or rheumatism	66.83
126	Dyslipidemia, Heart disease and Arthritis or rheumatism	65.96
127	Diabetes or high blood sugar, Heart disease and Stomach or other digestive disease	65.94
128	Dyslipidemia, Chronic lung diseases and Heart disease	64.15
129	Hypertension, Kidney disease and Arthritis or rheumatism	63.81
130	Dyslipidemia, Stomach or other digestive disease and Arthritis or rheumatism	63.66
131	Hypertension, Chronic lung diseases and Memory-related disease	62.28
132	Dyslipidemia, Kidney disease and Stomach or other digestive disease	60.88
133	Hypertension, Stroke and Stomach or other digestive disease	59.10
134	Cancer or malignant tumor, Chronic lung diseases and Stomach or other digestive disease	57.58

135	Cancer or malignant tumor, Chronic lung diseases and Arthritis or rheumatism	53.47
136	Hypertension, Stomach or other digestive disease and Arthritis or rheumatism	52.98
137	Dyslipidemia, Memory-related disease and Arthritis or rheumatism	52.69
138	Dyslipidemia, Stroke and Arthritis or rheumatism	52.69
139	Hypertension, Cancer or malignant tumor and Chronic lung diseases	50.75
140	Hypertension, Chronic lung diseases and Kidney disease	50.13
141	Liver disease, Heart disease and Arthritis or rheumatism	46.27
142	Hypertension, Cancer or malignant tumor and Arthritis or rheumatism	44.73
143	Hypertension, Liver disease and Kidney disease	43.92
144	Hypertension, Chronic lung diseases and Liver disease	43.13
145	Dyslipidemia, Cancer or malignant tumor and Arthritis or rheumatism	42.93
146	Dyslipidemia, Arthritis or rheumatism and Asthma	42.93
147	Hypertension, Diabetes or high blood sugar and Chronic lung diseases	42.81
148	Dyslipidemia, Kidney disease and Arthritis or rheumatism	42.40
149	Stomach or other digestive disease, Emotional, nervous, or psychiatric problems and Arthritis or rheumatism	42.28
150	Hypertension, Liver disease and Arthritis or rheumatism	41.18
151	Hypertension, Stomach or other digestive disease and Memory-related disease	39.40
152	Diabetes or high blood sugar, Stomach or other digestive disease and Arthritis or rheumatism	39.24
153	Hypertension, Arthritis or rheumatism and Asthma	37.27
154	Dyslipidemia, Liver disease and Arthritis or rheumatism	36.48
155	Heart disease, Emotional, nervous, or psychiatric problems and Arthritis or rheumatism	36.30
156	Hypertension, Chronic lung diseases and Arthritis or rheumatism	34.95
157	Dyslipidemia, Chronic lung diseases and Arthritis or rheumatism	34.70
158	Hypertension, Diabetes or high blood sugar and Stomach or other digestive disease	33.85
159	Cancer or malignant tumor, Stomach or other digestive disease and Arthritis or rheumatism	33.83
160	Liver disease, Heart disease and Stomach or other digestive disease	33.21
161	Dyslipidemia, Chronic lung diseases and Stomach or other digestive disease	29.89
162	Diabetes or high blood sugar, Liver disease and Arthritis or rheumatism	29.64
163	Hypertension, Kidney disease and Stomach or other digestive disease	26.42
164	Diabetes or high blood sugar, Chronic lung diseases and Stomach or other digestive disease	24.29
165	Hypertension, Emotional, nervous, or psychiatric problems and Arthritis or rheumatism	22.36
166	Hypertension, Liver disease and Stomach or other digestive disease	20.46

167	Hypertension, Cancer or malignant tumor and Stomach or other digestive disease	16.05
168	Hypertension, Stomach or other digestive disease and Emotional, nervous, or psychiatric problems	16.05
169	Hypertension, Chronic lung diseases and Stomach or other digestive disease	15.57
