Supplemental table 1 Individual centrality of gut microbiota research from 2004–2008.

No.	Major MeSH terms / MeSH subheadings	Betweenness	Closeness	Dgree
1	Intestines / microbiology	160.08	47.5	315
2	Probiotics / therapeutic use	63.683	41.5	150
3	Gastrointestinal Tract / microbiology	64.75	42	95
4	Feces / microbiology	73.692	42.5	121
5	Probiotics	62.334	41	97
6	Intestinal Mucosa / microbiology	51.568	41	87
7	Inflammatory Bowel Diseases / microbiology	14.857	35	79
8	Bacteria / metabolism	10.03	33	55
9	Colon / microbiology	21.72	36	42
10	Probiotics / administration and dosage	25.84	37	57
11	Bacteria / isolation and purification	10.533	33.5	59
12	Probiotics / pharmacology	30.055	37.333	51
13	Intestinal Mucosa / immunology	17.669	34.5	45
14	Bacteria / growth and development	47.236	36	47
15	Anti-Bacterial Agents / pharmacology	11.567	34	40
16	Diet	4.579	30.333	12
17	Bacterial Physiological Phenomena	4.235	31.333	39
18	Bifidobacterium / isolation and purification	4.961	31.333	42
19	Anti-Bacterial Agents / adverse effects	2.172	29.833	20
20	Bifidobacterium / physiology	12.033	34.5	42
21	Anti-Bacterial Agents / therapeutic use	3.497	30.833	29
22	Intestines / immunology	8.098	32.333	34
23	Intestinal Mucosa / metabolism	1.99	29.333	20
24	Polymerase Chain Reaction / methods	3.945	31.5	31
25	Oligosaccharides / pharmacology	12.463	33	36

26	Bifidobacterium / growth and development	4.423	31.833	36
27	Inflammatory Bowel Diseases / drug therapy	0.967	29.333	31
28	Bacteria / immunology	6.91	32	30
29	Lactobacillus / physiology	7.192	33.5	34
30	Lactobacillus / isolation and purification	1.761	29.833	29
31	Bacteria / drug effects	5.098	32	31
32	Dietary Supplements	4.811	31.833	24
33	Inflammatory Bowel Diseases / therapy	0.651	29.333	29
34	Intestinal Diseases / microbiology	2.74	29.833	16
35	Oligosaccharides / administration and dosage	8.243	33.333	30
36	Bacteria / genetics	4.838	31.5	23
37	Irritable Bowel Syndrome / microbiology	13.716	29.5	18
38	Bifidobacterium	3.41	30.5	26
39	Bifidobacterium / metabolism	2.99	29.833	18
40	Milk, Human / chemistry	1.184	28.833	17
41	Bifidobacterium / drug effects	6.194	32.333	24
42	Hypersensitivity / prevention and control	1.588	29.833	18
43	Hypersensitivity / microbiology	1.282	28.333	15
44	Inflammatory Bowel Diseases / immunology	3.672	30.833	27
45	Intestine, Small / microbiology	0	21.5	6
46	Intestines / drug effects	1.551	28.833	17
47	Biodiversity	5.135	32	27
48	Infant Formula / chemistry	6.557	31.833	23

49	Lactobacillus	0.24	27.333	17
50	Bacteria / classification	4.26	31	27

Supplemental table 2 Descriptive statistics for centrality measure about gut microbiota.

Period	Centralization	mean ± SD	Min	Max	Network centralization
2004-2007	Betweenness	16.46 ± 27.77	0	160.08	12.46%
	Closeness	32.86 ± 4.50	21.50	47.50	61.61%
	Degree	44.76 ± 47.73	6	315	20.10%
2008-2013	Betweenness	9.02 ± 7.42	0.54	32.86	2.70%
	Closeness	33.98 ± 3.49	28.50	41.50	36.23%
	Degree	149.14 ± 170.30	25	922	12.10%
2014-2018	Betweenness	15.35 ± 17.32	0.51	71.02	2.72%
	Closeness	49.65 ± 6.08	39.50	64.50	46.75%
	Degree	233.61± 282.54	48	1593	11.60%

Min: Minimum; Max: Maximum.

Supplemental table 3 Individual centrality of gut microbiota research from 2009–2013.

No.	Major MeSH terms / MeSH subheadings	Betweenness	Closeness	Dgree
1	Gastrointestinal Tract / microbiology	32.861	41.5	922
2	Intestines / microbiology	29.571	40.5	673
3	Metagenome	22.508	39.5	574
4	Feces / microbiology	12.034	37.5	303
5	Probiotics / therapeutic use	16.16	37	178
6	Microbiota	16.505	38	245
7	Metagenome / physiology	20.209	38.5	201
8	Intestinal Mucosa / microbiology	18.956	39	143
9	Bacteria / metabolism	16.304	38.5	195
10	Colon / microbiology	16.088	38	142
11	Prebiotics	13.837	37	149
12	Diet	7.944	35.5	122
13	Probiotics / administration and dosage	8.988	34.5	100
14	Bacteria / classification	11.681	36.5	195
15	Metagenome / genetics	8.605	34	130
16	Obesity / microbiology	4.814	33.5	148
17	Intestines / immunology	9.509	33	92
18	Bacteria / isolation and purification	6.211	35	138
19	Bacteria / genetics	8.131	35	158
20	Anti-Bacterial Agents / pharmacology	2.74	31.5	83
21	Inflammatory Bowel Diseases / microbiology	14.833	36.5	123
22	Biota	6.533	34	134

23	Metagenome / drug effects	5.891	32.5	93
24	Intestinal Mucosa / metabolism	6.096	32.5	68
25	Intestinal Mucosa / immunology	2.898	31	46
26	Metagenome / immunology	1.988	29	75
27	Microbiota / physiology	5.723	33.5	69
28	Biodiversity	6.437	33.5	123
29	Probiotics	5.645	32	64
30	Bacteria / growth and development	11.141	37	93
31	Gastrointestinal Tract / immunology	3.994	32	96
32	Irritable Bowel Syndrome / microbiology	6.571	34.5	77
33	Bacteria / drug effects	2.77	32	77
34	Bacteria / immunology	2.929	31	81
35	Inflammatory Bowel Diseases / immunology	2.419	30	51
36	Gastrointestinal Tract / metabolism	2.315	29	53
37	Probiotics / pharmacology	9.512	34	59
38	Metagenomics / methods	4.868	32	68
39	Anti-Bacterial Agents / therapeutic use	1.211	28.5	32
40	Metabolome	3.15	31	47
41	Dietary Supplements	1.665	28.5	32
42	Anti-Bacterial Agents / adverse effects	2.416	29.5	25
43	Feces / chemistry	1.796	29.5	43
44	Crohn Disease / microbiology	0.542	28.5	42

Supplemental table 4 Individual centrality of gut microbiota research from 2014–2018.

No.	Major MeSH terms / MeSH subheadings	Betweenness	Closeness	Dgree
1	Gastrointestinal Microbiome	68.602	62.5	1593
2	Gastrointestinal Tract / microbiology	71.018	64.5	1252
3	Gastrointestinal Microbiome / physiology	59.517	62	614
4	Microbiota	58.464	61.5	1022
5	Intestines / microbiology	55.779	62.5	975
6	Gastrointestinal Microbiome / drug effects	43.545	59	502
7	Feces / microbiology	53.435	62	593
8	Gastrointestinal Microbiome / immunology	29.313	56	298
9	Gastrointestinal Microbiome / genetics	34.893	57.5	352
10	Probiotics / therapeutic use	26.218	55.5	305
11	Diet	36.484	58.5	349
12	Microbiota / physiology	20.71	53	256
13	Probiotics / administration and dosage	21.194	53	215
14	Bacteria / metabolism	20.407	54.5	341
15	Bacteria / classification	20.271	53.5	379
16	Obesity / microbiology	12.559	52.5	308
17	Bacteria / isolation and purification	22.965	55	320
18	Dysbiosis / microbiology	23.843	55.5	244
19	Intestinal Mucosa / metabolism	13.662	50.5	169
20	Inflammatory Bowel Diseases /	26.158	56.5	285

	microbiology			
21	Intestinal Mucosa / microbiology	31.04	57.5	248
22	Microbiota / drug effects	13.271	50.5	176
23	Microbiota / immunology	6.247	46.5	158
24	Anti-Bacterial Agents / pharmacology	6.707	46	136
25	Prebiotics	8.707	50.5	176
26	Anti-Bacterial Agents / therapeutic use	8.04	48.5	126
27	Microbiota / genetics	7.615	47.5	150
28	Bacteria / genetics	8.871	50	189
29	Colon / microbiology	9.563	50	145
30	Intestines / immunology	3.68	44.5	126
31	Metagenomics / methods	4.627	46	134
32	Fecal Microbiota Transplantation	5.992	45.5	95
33	Gastrointestinal Tract / metabolism	2.381	43	108
34	Colorectal Neoplasms / microbiology	4.082	46	117
35	Anti-Bacterial Agents / adverse effects	5.923	46	73
36	Bile Acids and Salts / metabolism	6.121	46.5	78
37	Dietary Supplements	3.209	44	73
38	Gastrointestinal Tract / immunology	6.907	46.5	116
39	Models, Biological	9.852	49.5	98
40	Intestinal Mucosa / immunology	5.763	46.5	112
41	Bacteria / drug effects	7.317	47.5	150
42	Bacteria / growth and development	12.751	52	155
43	Obesity / metabolism	5.085	46	91

44	Crohn Disease / microbiology	6.962	47	128
45	Probiotics	7.666	47.5	93
46	RNA, Ribosomal, 16S / genetics	4.377	45.5	116
47	Prebiotics / administration and dosage	7.231	47.5	85
48	Probiotics / pharmacology	6.704	47.5	88
49	Diabetes Mellitus, Type 2 / microbiology	6.306	47	127
50	Non-alcoholic Fatty Liver Disease / microbiology	6.172	48.5	120
51	Metabolome	3.886	44.5	80
52	Fatty Acids, Volatile / metabolism	5.46	46	86
53	Irritable Bowel Syndrome / microbiology	7.789	49.5	98
54	Dysbiosis / complications	10.262	48.5	80
55	Feces / chemistry	4.104	44	66
56	Dysbiosis	4.609	45	103
57	Clostridium Infections / therapy	1.491	40.5	73
58	Dysbiosis / immunology	3.015	44	86
59	Fecal Microbiota Transplantation / methods	1.458	40	48
60	Inflammatory Bowel Diseases / immunology	1.541	42.5	89
61	Breast Feeding	2.942	43.5	59
62	Clostridium Infections / microbiology	4.269	44	69
63	Anti-Bacterial Agents / administration and dosage	4.846	44.5	87
64	Brain / physiology	0.513	39.5	74
65	Metagenome	4.018	45	97
66	Inflammation / immunology	4.593	43.5	64

Supplemental table 5 High-frequency MeSH terms/MeSH subheadings from the included papers on gut microbiota in 2004–2008.

Rank	Major MeSH terms / MeSH subheadings	Frequency	Proportion of frequency (%)	Cumulative percentage (%)
1	Intestines / microbiology	277	6.0244	6.0244
2	Probiotics / therapeutic use	125	2.7186	8.7429
3	Gastrointestinal Tract / microbiology	94	2.0444	10.7873
4	Feces / microbiology	93	2.0226	12.8099
5	Probiotics	58	1.2614	14.0713
6	Intestinal Mucosa / microbiology	54	1.1744	15.2458
7	Inflammatory Bowel Diseases / microbiology	39	0.8482	16.094
8	Bacteria / metabolism	39	0.8482	16.9421
9	Colon / microbiology	37	0.8047	17.7468
10	Probiotics / administration and dosage	34	0.7395	18.4863
11	Bacteria / isolation and purification	30	0.6525	19.1388
12	Probiotics / pharmacology	30	0.6525	19.7912
13	Intestinal Mucosa / immunology	29	0.6307	20.4219
14	Bacteria / growth and development	25	0.5437	20.9656
15	Anti-Bacterial Agents / pharmacology	25	0.5437	21.5094
16	Diet	25	0.5437	22.0531
17	Bacterial Physiological	24	0.522	22.575

	Phenomena			
18	Bifidobacterium / isolation and purification	24	0.522	23.097
19	Anti-Bacterial Agents / adverse effects	23	0.5002	23.5972
20	Bifidobacterium / physiology	22	0.4785	24.0757
21	Anti-Bacterial Agents / therapeutic use	21	0.4567	24.5324
22	Intestines / immunology	20	0.435	24.9674
23	Intestinal Mucosa / metabolism	20	0.435	25.4023
24	Polymerase Chain Reaction / methods	19	0.4132	25.8156
25	Oligosaccharides / pharmacology	18	0.3915	26.207
26	Bifidobacterium / growth and development	18	0.3915	26.5985
27	Inflammatory Bowel Diseases / drug therapy	18	0.3915	26.99
28	Bacteria / immunology	17	0.3697	27.3597
29	Lactobacillus / physiology	17	0.3697	27.7294
30	Lactobacillus / isolation and purification	17	0.3697	28.0992
31	Bacteria / drug effects	16	0.348	28.4472
32	Dietary Supplements	16	0.348	28.7951
33	Inflammatory Bowel Diseases / therapy	16	0.348	29.1431
34	Intestinal Diseases / microbiology	15	0.3262	29.4693
35	Oligosaccharides /	15	0.3262	29.7956

	administration and dosage			
36	Bacteria / genetics	13	0.2827	30.0783
37	Irritable Bowel Syndrome / microbiology	13	0.2827	30.361
38	Bifidobacterium	13	0.2827	30.6438
39	Bifidobacterium / metabolism	13	0.2827	30.9265
40	Milk, Human / chemistry	13	0.2827	31.2092
41	Bifidobacterium / drug effects	12	0.261	31.4702
42	Hypersensitivity / prevention and control	12	0.261	31.7312
43	Hypersensitivity / microbiology	12	0.261	31.9922
44	Inflammatory Bowel Diseases / immunology	12	0.261	32.2532
45	Intestine, Small / microbiology	11	0.2392	32.4924
46	Intestines / drug effects	11	0.2392	32.7316
47	Biodiversity	11	0.2392	32.9709
48	Infant Formula / chemistry	11	0.2392	33.2101
49	Lactobacillus	11	0.2392	33.4493
50	Bacteria / classification	11	0.2392	33.6886

Supplemental table 6 High-frequency MeSH terms/MeSH subheadings from the included papers on gut microbiota in 2009–2013.

Rank	Major MeSH terms / MeSH subheadings	Frequency	Proportion of frequency (%)	Cumulative percentage (%)
1	Gastrointestinal Tract / microbiology	668	5.1539	5.1539
2	Intestines / microbiology	558	4.3052	9.4591
3	Metagenome	347	2.6773	12.1364
4	Feces / microbiology	223	1.7205	13.857
5	Probiotics / therapeutic use	182	1.4042	15.2612
6	Microbiota	161	1.2422	16.5034
7	Metagenome / physiology	134	1.0339	17.5372
8	Intestinal Mucosa / microbiology	104	0.8024	18.3396
9	Bacteria / metabolism	102	0.787	19.1266
10	Colon / microbiology	98	0.7561	19.8827
11	Prebiotics	95	0.733	20.6157
12	Diet	84	0.6481	21.2638
13	Probiotics / administration and dosage	81	0.625	21.8887
14	Bacteria / classification	78	0.6018	22.4905
15	Metagenome / genetics	73	0.5632	23.0538
16	Obesity / microbiology	73	0.5632	23.617
17	Intestines / immunology	70	0.5401	24.1571
18	Bacteria / isolation and purification	69	0.5324	24.6895
19	Bacteria / genetics	67	0.5169	25.2064
20	Anti-Bacterial Agents /	66	0.5092	25.7156

	pharmacology			
21	Inflammatory Bowel Diseases / microbiology	65	0.5015	26.2171
22	Biota	60	0.4629	26.68
23	Metagenome / drug effects	60	0.4629	27.143
24	Intestinal Mucosa / metabolism	57	0.4398	27.5827
25	Intestinal Mucosa / immunology	56	0.4321	28.0148
26	Metagenome / immunology	50	0.3858	28.4006
27	Microbiota / physiology	49	0.3781	28.7786
28	Biodiversity	49	0.3781	29.1567
29	Probiotics	46	0.3549	29.5116
30	Bacteria / growth and development	46	0.3549	29.8665
31	Gastrointestinal Tract / immunology	45	0.3472	30.2137
32	Irritable Bowel Syndrome / microbiology	43	0.3318	30.5455
33	Bacteria / drug effects	40	0.3086	30.8541
34	Bacteria / immunology	40	0.3086	31.1627
35	Inflammatory Bowel Diseases / immunology	40	0.3086	31.4713
36	Gastrointestinal Tract / metabolism	39	0.3009	31.7722
37	Probiotics / pharmacology	37	0.2855	32.0577
38	Metagenomics / methods	34	0.2623	32.32
39	Anti-Bacterial Agents / therapeutic use	34	0.2623	32.5824

40	Metabolome	33	0.2546	32.837
41	Dietary Supplements	32	0.2469	33.0839
42	Anti-Bacterial Agents / adverse effects	32	0.2469	33.3308
43	Feces / chemistry	31	0.2392	33.5699
44	Crohn Disease / microbiology	31	0.2392	33.8091

Supplemental table 7 High-frequency MeSH terms/MeSH subheadings from the included papers on gut microbiota in 2014–2018.

Rank	Major MeSH terms / MeSH subheadings	Frequency	Proportion of frequency (%)	Cumulative percentage (%)
1	Gastrointestinal Microbiome	1651	4.9715	4.9715
2	Gastrointestinal Tract / microbiology	804	2.4210	7.3926
3	Gastrointestinal Microbiome / physiology	733	2.2072	9.5998
4	Microbiota	712	2.1440	11.7438
5	Intestines / microbiology	612	1.8429	13.5867
6	Gastrointestinal Microbiome / drug effects	516	1.5538	15.1405
7	Feces / microbiology	376	1.1322	16.2727
8	Gastrointestinal Microbiome / immunology	328	0.9877	17.2604
9	Gastrointestinal Microbiome / genetics	306	0.9214	18.1818
10	Probiotics / therapeutic use	274	0.8251	19.0069
11	Diet	239	0.7197	19.7266
12	Microbiota / physiology	201	0.6053	20.3318
13	Probiotics / administration and dosage	191	0.5751	20.9070
14	Bacteria / metabolism	178	0.5360	21.4430
15	Bacteria / classification	177	0.5330	21.9760
16	Obesity / microbiology	162	0.4878	22.4638
17	Bacteria / isolation and purification	159	0.4788	22.9426
18	Dysbiosis / microbiology	135	0.4065	23.3491

19	Intestinal Mucosa / metabolism	131	0.3945	23.7436
20	Inflammatory Bowel Diseases / microbiology	129	0.3884	24.1320
21	Intestinal Mucosa / microbiology	125	0.3764	24.5084
22	Microbiota / drug effects	120	0.3613	24.8698
23	Microbiota / immunology	112	0.3373	25.2070
24	Anti-Bacterial Agents / pharmacology	108	0.3252	25.5322
25	Prebiotics	106	0.3192	25.8514
26	Anti-Bacterial Agents / therapeutic use	105	0.3162	26.1676
27	Microbiota / genetics	105	0.3162	26.4838
28	Bacteria / genetics	89	0.2680	26.7518
29	Colon / microbiology	87	0.2620	27.0138
30	Intestines / immunology	86	0.2590	27.2727
31	Metagenomics / methods	79	0.2379	27.5106
32	Fecal Microbiota Transplantation	76	0.2289	27.7395
33	Gastrointestinal Tract / metabolism	75	0.2258	27.9653
34	Colorectal Neoplasms / microbiology	74	0.2228	28.1881
35	Anti-Bacterial Agents / adverse effects	73	0.2198	28.4080
36	Bile Acids and Salts / metabolism	70	0.2108	28.6187
37	Dietary Supplements	70	0.2108	28.8295
38	Gastrointestinal Tract / immunology	70	0.2108	29.0403

39	Models, Biological	70	0.2108	29.2511
40	Intestinal Mucosa / immunology	70	0.2108	29.4619
41	Bacteria / drug effects	69	0.2078	29.6697
42	Bacteria / growth and development	69	0.2078	29.8774
43	Obesity / metabolism	69	0.2078	30.0852
44	Crohn Disease / microbiology	66	0.1987	30.2840
45	Probiotics	66	0.1987	30.4827
46	RNA, Ribosomal, 16S / genetics	64	0.1927	30.6754
47	Prebiotics / administration and dosage	63	0.1897	30.8651
48	Probiotics / pharmacology	63	0.1897	31.0548
49	Diabetes Mellitus, Type 2 / microbiology	62	0.1867	31.2415
50	Non-alcoholic Fatty Liver Disease / microbiology	60	0.1807	31.4222
51	Metabolome	58	0.1747	31.5969
52	Fatty Acids, Volatile / metabolism	57	0.1716	31.7685
53	Irritable Bowel Syndrome / microbiology	57	0.1716	31.9401
54	Dysbiosis / complications	56	0.1686	32.1088
55	Feces / chemistry	54	0.1626	32.2714
56	Dysbiosis	54	0.1626	32.4340
57	Clostridium Infections / therapy	51	0.1536	32.5876
58	Dysbiosis / immunology	49	0.1476	32.7351
59	Fecal Microbiota	49	0.1476	32.8827

	Transplantation / methods			
60	Inflammatory Bowel Diseases / immunology	49	0.1476	33.0302
61	Breast Feeding	48	0.1445	33.1747
62	Clostridium Infections / microbiology	48	0.1445	33.3193
63	Anti-Bacterial Agents / administration and dosage	47	0.1415	33.4608
64	Brain / physiology	47	0.1415	33.6023
65	Metagenome	46	0.1385	33.7409
66	Inflammation / immunology	46	0.1385	33.8794