

Supplementary material

Table S1: Purely spatial clusters of EMS requests in Mashhad, Iran from June 2018 to May 2019

Cluster	Location ID	Census tracts (no.)	Coordinates and radius	Population	Cases (no.)	Expected cases (no.)	Annual cases/100000	OE	RR	LLR	p-value
1	1284, 355, 341, 1279, 380, 366, 394, 331, 327, 329, 321, 383, 415,337, 336, 399, 81, 429, 348, 386, 305, 449, 404, 413, 311, 98, 370, 302, 442, 393, 334, 435, 450, 400, 80, 328, 1282, 471, 437, 292,1258, 110, 462, 89, 358, 460, 276, 1283, 310, 548, 401, 428, 286, 409	52	(36.286793 N, 59.610690 E) / 1.60 km	31912	10546	1350.66	2011702.7	7.81	8.42	12823.256692	< 0.001
2	970, 942, 1009, 963, 1000, 1012, 922, 159, 977, 907, 1030, 1046, 943, 951, 1018, 835, 1017, 994, 893, 1044, 878, 978, 1047, 842, 1024, 831, 515, 953, 916, 1085, 806, 1034, 1097, 1014, 1069, 848, 1035, 987, 927, 782, 1068, 1001, 976, 1089, 1021, 125, 1031, 1091, 124, 915, 962, 1111, 1058, 1088, 999, 754, 909, 930, 843, 939, 851, 1077, 992, 1086, 830, 1025, 872, 1114, 959, 1140, 1003, 749, 1043, 1142, 1052, 712, 678, 1023, 795, 1050, 1145, 938, 1084, 947, 975, 997, 838, 1121, 887, 1008, 983, 1147, 1154, 787, 657, 685, 659, 1033, 1149, 816, 743, 711, 1028, 1153, 740, 1063, 1160, 744, 969, 1125, 902, 934	112	(36.286793 N, 59.610690 E) / 1.60 km	31912	10546	1350.66	2011702.7	7.81	8.42	12823.256692	< 0.001
3	893, 831, 951, 907, 953, 963, 806, 927, 159, 994, 125, 515,1000,942, 835, 843, 970, 1014, 1017, 987, 851, 962, 909,1009, 939, 922, 1034, 842, 999, 1031, 1046, 782, 1044, 977, 1012, 878, 1030,1003,943, 1025, 838, 938, 1058, 1068, 787, 1069, 1018,975, 754, 1043, 740, 1097, 124, 978, 916, 1077, 848, 712, 1085, 1047, 1008, 739, 1024, 1111, 902, 776, 497, 827, 1114, 1033, 934, 1091, 744, 982,732,678, 1035, 915, 1121, 976, 749, 1001, 1089, 1063, 1021, 507, 731, 830	88	(36.326673 N, 59.530487 E) / 2.19 km	169301	10199	7165.56	366714.5	1.42	1.46	605.555643	< 0.001
4	46, 44, 47, 42, 43, 48, 41, 49, 40, 39, 37, 66, 38, 36, 52, 34, 68, 33, 32, 67, 59, 31, 165, 1272, 30, 1268, 35, 29, 175, 27, 185, 26, 51, 163, 189, 69, 1288, 28, 45, 177, 197, 62, 93, 171, 201, 209, 58,25, 24, 50, 215, 207, 174, 231, 214, 206, 220, 223, 72, 20, 241,232,205, 237, 238, 172, 160, 15, 21, 258, 257, 1254, 227, 249,245, 95,22, 263, 242, 1255	80	(36.250414 N, 59.597951 E) / 2.45 km	147778	8422	6254.61	346924.9	1.35	1.37	1357.960096.37	< 0.001
5	369, 363, 340, 391, 365, 345, 359, 373, 356, 326, 411, 440,352, 1259, 374, 97, 398, 339, 376, 105, 309, 346, 103, 315, 438, 361, 287,408, 424, 108, 301, 375, 78, 293, 521, 323, 297, 91, 102,703, 564,306, 458, 417, 280,128, 543, 372, 532, 289,264,574,296, 539, 392, 576, 260, 277, 431, 536, 493, 86, 522, 485, 412, 360, 480, 628,269, 484, 389, 354, 464, 251, 1256, 575, 602, 595, 335, 342, 569,403,	104	(36.288037 N, 59.559853 E) / 2.83 km	166957	8019	7066.35	292378.6	1.13	1.14	65.302550	< 0.001

	627, 1260, 85, 535, 645, 607,278, 459, 638, 664, 611,131,635,715, 1263, 1261, 583, 695, 457,1262, 714, 705										
6	1158, 1163, 1152, 1170, 1146,1168, 1136, 1179, 1150,1176,1109, 1173, 1116, 1195, 1148, 1131, 1112, 1180, 1175, 1159, 1070, 1211, 1098, 1117, 1162, 1130, 1066, 1062, 1172, 1245, 1038, 1188, 1196, 1143, 1207, 1055, 1094, 1041, 1167, 1056, 1221, 1118	42	(36.353674 N, 59.480199 E) / 2.09 km	174747	8003	7396.0 6	278787.4	1.08	1.09	25.791315	< 0.001
7	432, 434, 381, 433, 453, 451, 405, 382, 421, 447, 367, 443, 470, 524, 461, 357, 528, 418, 469, 445, 368, 555, 371, 525, 82, 109, 537, 351, 556, 107, 544, 350, 538, 570, 338, 463, 353, 562, 567, 581, 534, 362, 531, 517, 134, 577, 563, 384, 479, 347, 483, 551, 402, 580, 330, 425, 578, 122, 343, 133, 101, 478, 599, 454, 487, 332, 589, 121, 622, 609, 492, 632, 314, 319, 422, 1265, 379, 427, 325, 491, 318, 1264, 488,612, 641, 605, 654, 320, 349, 526	90	(36.292581 N, 59.647522 E) / 1.85 km	178473	8012	7553.7 6	273274.1	1.06	1.06	14.506404	< 0.001
<p>A cluster is statistically significant when its log likelihood ratio is greater than the critical value, which is, for significance level:</p> <p>Gumbel Critical Values: 0.00001: 19.268292 0.0001: 16.320911</p> <p>Standard Monte Carlo Critical Values: 0.001: 14.714970 0.01: 10.217706 0.05: 8.568208</p>											

Table S2: Spatio-temporal clusters of EMS requests in Mashhad, Iran from June 2018 to May 2019

Cluster	Location ID	Census tracts (no.)	Coordinates and radius	Time intervals	Population	Cases (no.)	Expected cases (no.)	Annual cases/100000	OE	RR	LLR	p-value
1	1284, 355, 341, 1279, 380, 366, 394, 331, 327, 329, 321, 383, 415, 337, 336, 399, 81, 429, 348, 386, 305, 449, 404, 413, 311, 98, 370, 302, 442, 393, 334, 435, 450, 400, 80, 328, 1282, 471, 437, 292, 1258, 110, 462, 89, 358, 460, 276, 1283, 310, 548, 401, 428, 286, 409	54	(36.286793 N, 59.610690 E) / 1.60 km	(11:00AM - 02:59PM), (03:00PM - 06:59PM), (07:00PM - 10:59PM)	31912	6676	675.33	2546961.4	9.89	10.38	9439.355710	< 0.001
2	831, 893, 806, 907, 125, 951, 515, 953, 159, 927, 963, 843, 835, 942, 994, 851, 970, 782, 1000, 842, 909, 987, 962, 1014, 922, 1017, 939, 1009, 878, 999, 1034, 1031, 1046, 977, 787, 943, 1044, 838, 754, 1012, 712, 740, 938, 1030, 1003, 124, 1025, 848, 916, 1058, 1068, 1018, 739, 1069, 978, 975, 744, 1043, 776, 1097, 678, 1047, 1077, 497, 732, 1008, 902, 1024, 1085, 827, 749, 934, 657, 915, 1111, 1033, 731, 976, 982, 1035, 1114, 830, 1091, 737, 1001, 507, 659, 1021, 795, 158, 1121, 1089, 1063, 930, 711, 1016, 819, 1054, 685, 588, 620, 1088, 664, 774, 920, 992, 959, 1051, 714, 1140, 872, 777, 995, 138, 743, 621, 803, 1086, 701, 1120, 474, 895, 554, 887, 1142, 1023, 816, 947, 1052, 661, 457, 593, 1119, 762, 1050, 523, 1145, 940, 628, 669, 552, 84, 997, 1039, 813, 645, 983, 1154, 626, 1113, 441, 1019, 1084, 472, 452, 529, 459, 1108, 769, 715, 86, 864, 1147, 532, 703, 676, 1028, 969, 818, 1153, 489, 1160, 1171, 1149, 986, 1029, 758, 493, 700, 766, 901	168	(36.324667 N, 59.529982 E) / 3.33 km	11:00AM - 02:59PM - 03:00PM - 06:59PM - 07:00PM - 10:59PM	375591	12245	7948.33	396920.6	1.54	1.60	1073.547402	< 0.001
A cluster is statistically significant when its log likelihood ratio is greater than the critical value, which is, for significance level:			Gumbel Critical Values: 0.00001: 21.620195 0.0001: 18.555906			Standard Monte Carlo Critical Values: 0.001: 15.064409 0.01: 12.108057 0.05: 10.187626						

Table S3: Clusters of spatial variations in temporal trends of EMS requests in Mashhad, Iran from June 2018 to May 2019

Cluster	Location ID	Census tracts (no.)	Coordinates and radius	Population	Cases (no.)	Expected cases (no.)	Annual cases/100000	OE	RR	Inside time trend	Outside time trend	LLR	p-value
1	1287, 1286, 1124, 1045, 1064, 1100, 862, 1135, 988, 1067, 1127, 1122, 1285, 913, 984, 1132, 910, 933, 1083, 1061, 941, 974, 993, 1006, 894, 908, 1129, 841, 924, 1005, 840, 890, 923, 1271, 859, 844, 1075, 836, 954, 929, 900, 1079, 891, 931, 1059, 871, 846, 1007, 904, 807, 883, 828, 936, 126, 514, 1137, 157, 1032, 812, 1151, 501, 845, 495, 822, 932, 1123, 898, 926, 1096, 964, 791, 991, 780, 817, 861, 799, 1126, 849, 935, 767, 824, 906, 502, 1049, 792, 1095, 903, 773, 839, 127, 498, 945, 1082, 746, 826, 117, 797, 857, 734, 779, 147, 880, 1134, 1278, 747, 884, 786, 149, 1165, 735, 809, 755, 778, 503, 905, 679, 671, 145, 1102, 866, 682, 730, 768, 850, 796, 1065, 733, 955, 808, 722, 956, 144, 886, 148, 496, 505, 723, 716, 115, 113, 745, 728, 717, 764, 753, 966, 820, 116, 677, 1037, 155, 726, 688, 888, 801, 683, 889, 142, 694, 738, 725, 852, 704, 663, 713, 868, 972, 736, 654, 500, 653, 640, 719, 649, 151, 949, 914, 651, 724, 689, 154, 751, 998, 624, 770, 648, 660, 690, 721, 609, 641, 622, 652, 632, 727, 821, 965, 1078, 643, 612, 874, 896, 599, 625, 140, 1013, 589, 833, 610, 1277, 614, 967, 122, 605, 1074, 691, 684, 925, 752, 619, 487, 788, 637, 156, 121, 488, 668, 483, 650, 1093, 698, 580, 630, 815, 973, 492, 577, 697, 772, 479, 581, 137, 478, 879, 601, 1042, 644, 491, 912, 567, 784, 570, 578, 708, 563, 981, 152, 592, 810, 1265, 834, 150, 562, 123, 597, 510, 556, 937, 794, 882, 134, 555, 551, 582, 544, 1301, 989, 674, 1057, 133, 1290, 757, 1267	257	(36.340728 N, 59.652538 E) / 4.60 km	655054	24403	27724.76	226775.5	0.88	0.85	15.288% increase	11.403% increase	32.769529	0.001
2	10, 8, 7, 4, 13, 11, 6, 5, 2, 14, 3, 17, 9, 18, 12, 23, 16, 22, 19, 21	20	(36.223193 N, 59.620842 E) / 1.42 km	69371	1362	2936.08	119516.9	0.46	0.46	21.366% annual increase	12.040% annual increase	11.932280	0.010

A cluster is statistically significant when its log likelihood ratio is greater than the critical value, which is, for significance level:

Gumbel Critical Values:
0.00001: 19.711964
0.0001: 17.129168

Standard Monte Carlo Critical Values:
0.001: 13.711889
0.01: 11.819526
0.05: 10.290298

Table S4: Detected significant high response time clusters in Mashhad, Iran from Jun 2018 to May 2019

Cluster	Location ID	Census tracts (no.)	Coordinates and radius	Population	Cases (no.)	Expected cases (no.)	Annual cases/100000	OE	RR	LLR	p-value
1	804, 805, 512, 748, 775, 968, 136, 672, 760, 758, 112, 693, 680, 813,986, 705, 1249, 114, 676, 636, 635, 695, 638, 919, 673, 837, 961,706, 607, 803, 647, 895, 940, 741, 611, 629, 1011, 1010, 777, 771, 627, 715, 825, 595, 1027, 631, 793, 990, 702, 774, 586, 819, 920,958, 484, 138, 513, 681, 881, 928, 602, 1029, 604, 480, 485, 763,1048, 1019, 858, 583, 645, 576, 995, 139, 509, 575, 957, 486, 158,507, 1060, 718, 1015, 832, 921, 714, 120, 781, 569, 574, 1073, 1072, 1002, 493, 756, 1039, 128, 655, 667, 885, 737, 617, 827, 572, 950, 543, 511, 497, 131, 902, 539, 477, 628, 934, 899, 776, 1101, 1053,1016, 536, 742, 707, 918, 564, 1081, 634, 897, 982, 600, 108, 1080,119, 971, 658, 687, 664, 521, 731, 1274, 1090, 1087, 802, 1040, 561, 1051, 522, 535, 944, 996, 1115, 153, 709, 573, 739, 1113, 855, 829,854, 670, 618, 458, 1110, 750, 464, 838, 917, 542, 938, 732, 863, 105, 789, 1092, 1022, 482, 787, 1054, 860, 975, 877, 867, 980, 438,675, 560, 869, 639, 1008, 587, 873, 1099, 696, 1301, 989, 1128, 865, 516, 740, 856, 1033, 1263, 761, 937, 431, 85, 596, 481, 520, 424,882, 666, 440, 1057, 1139, 800, 1063, 547, 1119, 981, 1138, 1133, 398, 1141, 1003, 411, 623	216	(36.320720 N, 59.574306 E) / 3.08 km	15972	2746	1748.40	17110.3	1.57	1.71	284.165816	<0.001
2	64, 63, 162, 167, 74, 71, 73, 60, 182, 176, 61, 54, 65, 75, 181, 169, 164, 170, 202, 179, 234, 196, 194, 76, 178, 70, 94, 192, 56, 218, 243, 1276, 173, 208, 180, 210, 250, 239, 190, 228, 212, 255, 53	43	(36.258228 N, 59.663799 E) / 1.52 km	2074	571	227.03	27399.5	2.52	2.58	187.023201	<0.001
3	519, 533, 541, 467, 448, 456, 549, 87, 1300, 83, 439, 129, 568, 540, 455, 416, 426, 579, 130, 407, 518, 406, 419, 545, 396, 465, 466, 584, 88, 423, 397, 385, 526, 708, 395, 546, 427, 592, 378, 1264, 630, 454, 637, 697, 425, 140	46	No overlap	1830	513	200.32	27898.5	2.56	2.62	173.312723	<0.001
4	779, 773, 755, 682, 144, 799, 728, 746, 797, 501, 127, 822, 745, 683, 713, 778, 704, 730, 502, 828, 495, 846, 807, 694, 734, 113, 724, 738, 690, 764, 660, 844, 514, 824, 643, 796, 891, 671, 890, 780, 840, 151, 157, 614, 641, 716, 727, 619, 894, 649, 605, 908, 941, 809, 691, 650, 632, 654, 923, 801, 751, 505, 931, 841, 121, 903, 722, 601, 492, 688, 913, 126, 910, 698, 491, 644, 622, 147, 880, 984, 668, 770, 988, 597, 684, 932, 599, 993, 142	89	(36.316592 N, 59.638368 E) / 1.44 km	5823	917	637.42	15672.5	1.44	1.47	56.878035	<0.001
5	1205, 1209, 1193, 1213, 1194, 1222, 1226, 1216, 1199, 1202, 1219, 1220, 1184, 1187, 1227, 1107, 1230, 1214, 1224, 1106, 1217, 1229,1235, 1234, 1231, 1164, 1189, 1174, 1225, 1204, 1105, 1169, 1239, 1156, 1181,	51	(36.363755 N, 59.514826 E) / 1.46 km	3402	502	372.41	14685.4	1.35	1.36	20.933652	<0.001

	1155, 1242, 1223, 1237, 1177, 1228, 1157, 1153, 1236, 1210, 1200, 1160, 1241, 1238, 1104, 1186, 1147													
<p>A cluster is statistically significant when its log likelihood ratio is greater than the critical value, which is, for significance level:</p> <table border="0"> <tr> <td></td> <td> Gumbel Critical Values: 0.00001: 19.633018 0.0001: 16.720557 </td> <td> Standard Monte Carlo Critical Values: 0.001: 13.669926 0.01: 10.713829 0.05: 8.944296 </td> </tr> </table>													Gumbel Critical Values: 0.00001: 19.633018 0.0001: 16.720557	Standard Monte Carlo Critical Values: 0.001: 13.669926 0.01: 10.713829 0.05: 8.944296
	Gumbel Critical Values: 0.00001: 19.633018 0.0001: 16.720557	Standard Monte Carlo Critical Values: 0.001: 13.669926 0.01: 10.713829 0.05: 8.944296												

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