

**Table S1.** Sample learning and prediction accuracy comparison (temperature forecasting VTH).

<b>Region</b>	<b>MPE</b>	<b>MSE</b>	<b>SDE</b>
<b>China</b>	0.000296	0.005300	0.072800
<b>Beijing</b>	0.001737	0.000931	0.030512
<b>Tianjin</b>	0.001076	0.000051	0.007160
<b>Hebei</b>	0.002358	0.000541	0.023249
<b>Shanxi</b>	0.000000	0.000000	0.000000
<b>Inner Mongolia</b>	0.001108	0.000032	0.005623
<b>Liaoning</b>	0.000285	0.000034	0.005794
<b>Jilin</b>	0.002201	0.000115	0.010707
<b>Heilongjiang</b>	0.001359	0.000125	0.011194
<b>Shanghai</b>	0.000032	0.000028	0.005294
<b>Jiangsu</b>	0.000000	0.000000	0.000000
<b>Zhejiang</b>	0.000002	0.000000	0.000186
<b>Anhui</b>	0.000325	0.000008	0.002863
<b>Fujian</b>	0.000429	0.000065	0.008038
<b>Jiangxi</b>	0.000993	0.000099	0.009925
<b>Shandong</b>	0.000094	0.000052	0.007185
<b>Henan</b>	0.000160	0.000061	0.007812
<b>Hubei</b>	0.000694	0.000102	0.010094
<b>Hunan</b>	0.001348	0.000102	0.010115
<b>Guangdong</b>	0.000450	0.001427	0.037775
<b>Guangxi</b>	0.000156	0.000017	0.004063
<b>Hainan</b>	0.000005	0.000000	0.000076
<b>Chongqing</b>	0.000000	0.000000	0.000001
<b>Sichuan</b>	0.000236	0.000076	0.008695
<b>Guizhou</b>	0.000000	0.000000	0.000001
<b>Yunnan</b>	0.000050	0.000006	0.002492
<b>Shaanxi</b>	0.000001	0.000000	0.000019
<b>Gansu</b>	0.002249	0.000068	0.008275
<b>Qinghai</b>	0.000019	0.000000	0.000153
<b>Ningxia</b>	0.001355	0.000008	0.002798
<b>Xinjiang</b>	0.000086	0.000003	0.001823

**Table S2.** Sample learning and prediction accuracy comparison (temperature forecasting OWT (100 million)).

Region	MPE	MSE	SDE
China	0.000252	0.004488	0.066990
Beijing	0.000871	0.000700	0.026458
Tianjin	0.001308	0.000058	0.007612
Hebei	0.002730	0.000529	0.023005
Shanxi	0.000257	0.000011	0.003264
Inner Mongolia	0.001178	0.000029	0.005367
Liaoning	0.000273	0.000029	0.005359
Jilin	0.001976	0.000091	0.009552
Heilongjiang	0.001286	0.000104	0.010191
Shanghai	0.000030	0.000025	0.005010
Jiangsu	0.000000	0.000000	0.000001
Zhejiang	0.000000	0.000000	0.000011
Anhui	0.000049	0.000001	0.001220
Fujian	0.000583	0.000070	0.008377
Jiangxi	0.000844	0.000084	0.009157
Shandong	0.000061	0.000029	0.005419
Henan	0.000168	0.000056	0.007499
Hubei	0.000672	0.000079	0.008904
Hunan	0.001355	0.000100	0.009996
Guangdong	0.000488	0.001527	0.039079
Guangxi	0.000115	0.000012	0.003405
Hainan	0.000016	0.000000	0.000349
Chongqing	0.000000	0.000000	0.000001
Sichuan	0.000272	0.000079	0.008861
Guizhou	0.000000	0.000000	0.000000
Yunnan	0.000055	0.000008	0.002748
Shaanxi	0.000020	0.000000	0.000447
Gansu	0.002206	0.000066	0.008107
Qinghai	0.001668	0.000004	0.001889
Ningxia	0.001226	0.000006	0.002505
Xinjiang	0.000079	0.000003	0.001594

**Table S3.** Sample learning and prediction accuracy comparison (temperature forecasting NOH (10,000 people)).

Region	MPE	MSE	SDE
China	0.000044	1970.296095	44.388017
Beijing	0.000957	19.130206	4.373809
Tianjin	0.000119	1.566336	1.251534
Hebei	0.002883	254.402122	15.949988
Shanxi	0.000260	26.438153	5.141804
Inner Mongolia	0.000428	8.783828	2.963752
Liaoning	0.000379	16.213131	4.026553
Jilin	0.001271	18.086354	4.252805
Heilongjiang	0.002088	67.237358	8.199839
Shanghai	0.000006	0.047217	0.217294
Jiangsu	0.000618	22.453488	4.738511
Zhejiang	0.000011	0.024293	0.155861

Anhui	0.000267	22.754719	4.770191
Fujian	0.001282	35.982166	5.998514
Jiangxi	0.000038	0.055206	0.234960
Shandong	0.000183	275.718338	16.604769
Henan	0.000969	116.294052	10.783972
Hubei	0.000223	30.227417	5.497947
Hunan	0.001860	86.571669	9.304390
Guangdong	0.000386	110.342589	10.504408
Guangxi	0.000001	0.002497	0.049968
Hainan	0.000211	0.437663	0.661561
Chongqing	0.000341	8.059000	2.838838
Sichuan	0.000444	135.583188	11.644019
Guizhou	0.000000	0.000000	0.000018
Yunnan	-0.000068	46.753858	6.837679
Shaanxi	0.000101	2.743315	1.656296
Gansu	0.002920	27.769131	5.269642
Qinghai	0.000064	0.000424	0.020597
Ningxia	0.001123	2.183168	1.477555
Xinjiang	0.000956	26.025765	5.101545

**Table S4.** Sample learning and prediction accuracy comparison (humidity forecasting VTH).

Region	MPE	MSE	SDE
China	0.000259	0.004053	0.063664
Beijing	0.001203	0.000275	0.016584
Tianjin	0.000333	0.000020	0.004513
Hebei	0.000389	0.000059	0.007697
Shanxi	0.000125	0.000004	0.002043
Inner Mongolia	0.000333	0.000006	0.002459
Liaoning	0.000404	0.000078	0.008833
Jilin	0.001250	0.000069	0.008297
Heilongjiang	0.001241	0.000123	0.011094
Shanghai	0.000035	0.000015	0.003911
Jiangsu	0.000000	0.000000	0.000013
Zhejiang	0.000083	0.000066	0.008116
Anhui	0.000065	0.000002	0.001411
Fujian	0.000354	0.000041	0.006384
Jiangxi	0.000590	0.000017	0.004141
Shandong	0.000565	0.000645	0.025397
Henan	0.000172	0.000041	0.006368
Hubei	0.000580	0.000085	0.009219
Hunan	0.000000	0.000000	0.000000
Guangdong	0.000127	0.000335	0.018299
Guangxi	0.000838	0.000117	0.010802
Hainan	0.000314	0.000001	0.001121
Chongqing	0.000973	0.000025	0.004960
Sichuan	0.000521	0.000173	0.013141
Guizhou	0.000032	0.000000	0.000472
Yunnan	0.000000	0.000000	0.000314
Shaanxi	0.001042	0.000080	0.008928

Gansu	0.002010	0.000081	0.009019
Qinghai	0.000019	0.000000	0.000083
Ningxia	0.001141	0.000007	0.002628
Xinjiang	0.000353	0.000018	0.004284

**Table S5.** Sample learning and prediction accuracy comparison (humidity forecasting OWT (100 million)).

Region	MPE	MSE	SDE
China	0.003374	0.058088	0.003374
Beijing	0.000257	0.016031	0.000257
Tianjin	0.000001	0.001164	0.000001
Hebei	0.000019	0.004318	0.000019
Shanxi	0.000008	0.002830	0.000008
Inner Mongolia	0.000002	0.001506	0.000002
Liaoning	0.000077	0.008758	0.000077
Jilin	0.000069	0.008280	0.000069
Heilongjiang	0.000098	0.009903	0.000098
Shanghai	0.000014	0.003755	0.000014
Jiangsu	0.000000	0.000022	0.000000
Zhejiang	0.000076	0.008734	0.000076
Anhui	0.000000	0.000136	0.000000
Fujian	0.000037	0.006053	0.000037
Jiangxi	0.000014	0.003799	0.000014
Shandong	0.000565	0.023771	0.000565
Henan	0.000039	0.006274	0.000039
Hubei	0.000067	0.008160	0.000067
Hunan	0.000000	0.000000	0.000000
Guangdong	0.001636	0.040452	0.001636
Guangxi	0.000044	0.006657	0.000044
Hainan	0.000001	0.000777	0.000001
Chongqing	0.000053	0.007266	0.000053
Sichuan	0.000141	0.011886	0.000141
Guizhou	0.000000	0.000000	0.000000
Yunnan	0.000000	0.000647	0.000000
Shaanxi	0.000078	0.008829	0.000078
Gansu	0.000076	0.008704	0.000076
Qinghai	0.000005	0.002133	0.000005
Ningxia	0.000005	0.002324	0.000005
Xinjiang	0.000033	0.005712	0.000033

**Table S6.** Sample learning and prediction accuracy comparison (humidity forecasting NOH (10,000 people)).

Region	MPE	MSE	SDE
China	0.000135	1630.011984	40.373407
Beijing	0.001182	22.630093	4.757110
Tianjin	0.000430	2.786358	1.669239
Hebei	0.004929	421.082367	20.520292
Shanxi	0.000176	29.496203	5.431041
Inner Mongolia	0.000150	7.473908	2.733845
Liaoning	0.000294	21.336610	4.619157
Jilin	0.000965	13.713701	3.703201
Heilongjiang	0.001794	78.336723	8.850804
Shanghai	0.000049	1.686020	1.298468
Jiangsu	0.000989	152.752013	12.359289
Zhejiang	0.000019	0.486412	0.697432
Anhui	0.000000	0.000001	0.000801
Fujian	0.001600	26.933498	5.189749
Jiangxi	0.000863	73.052363	8.547067
Shandong	0.000567	354.972466	18.840713
Henan	0.000835	80.442702	8.968986
Hubei	0.000735	39.259898	6.265772
Hunan	0.001931	85.982476	9.272674
Guangdong	0.001496	137.847088	11.740830
Guangxi	0.000005	0.361892	0.601575
Hainan	0.000066	0.052808	0.229800
Chongqing	0.000469	1.807055	1.344268
Sichuan	0.000405	126.769778	11.259209
Guizhou	0.000453	7.685597	2.772291
Yunnan	-0.000196	52.116854	7.219200
Shaanxi	0.000000	0.000000	0.000498
Gansu	0.002448	30.362087	5.510180
Qinghai	0.012486	6.584755	2.566078
Ningxia	0.001381	1.278189	1.130570
Xinjiang	0.001377	32.254166	5.679275

**Table S7.** Sample learning and prediction accuracy comparison (precipitation forecasting VTH).

Region	MPE	MSE	SDE
China	0.000296	0.004604	0.067855
Beijing	0.002875	0.000797	0.028236
Tianjin	0.000378	0.000028	0.005317
Hebei	0.001867	0.000328	0.018121
Shanxi	0.001259	0.000075	0.008634
Inner Mongolia	0.000247	0.000003	0.001646
Liaoning	0.000258	0.000046	0.006770
Jilin	0.001905	0.000122	0.011028
Heilongjiang	0.001349	0.000126	0.011217
Shanghai	0.000063	0.000036	0.005987
Jiangsu	0.000016	0.000010	0.003100
Zhejiang	0.000175	0.000114	0.010688

Anhui	0.000888	0.000049	0.006969
Fujian	0.000420	0.000073	0.008520
Jiangxi	0.000598	0.000021	0.004585
Shandong	0.000434	0.000432	0.020785
Henan	0.000410	0.000082	0.009052
Hubei	0.001194	0.000172	0.013099
Hunan	0.000083	0.000006	0.002456
Guangdong	0.000305	0.001057	0.032512
Guangxi	0.000570	0.000087	0.009348
Hainan	0.000000	0.000000	0.000001
Chongqing	0.000000	0.000000	0.000014
Sichuan	0.000237	0.000061	0.007808
Guizhou	0.001172	0.000040	0.006293
Yunnan	0.000062	0.000010	0.003205
Shaanxi	0.001060	0.000080	0.008949
Gansu	0.000001	0.000000	0.000008
Qinghai	0.000019	0.000000	0.000242
Ningxia	0.001506	0.000008	0.002902
Xinjiang	0.000122	0.000010	0.003126

**Table S8.** Sample learning and prediction accuracy comparison (precipitation forecasting OWT (100 million)).

Region	MPE	MSE	SDE
China	0.000252	0.003812	0.061742
Beijing	0.002094	0.000603	0.024547
Tianjin	0.000429	0.000031	0.005571
Hebei	0.001320	0.000146	0.012099
Shanxi	0.000835	0.000043	0.006571
Inner Mongolia	0.000015	0.000000	0.000159
Liaoning	0.000262	0.000077	0.008776
Jilin	0.001682	0.000102	0.010076
Heilongjiang	0.001343	0.000115	0.010725
Shanghai	0.000056	0.000033	0.005729
Jiangsu	0.000004	0.000003	0.001628
Zhejiang	0.000138	0.000080	0.008918
Anhui	0.000101	0.000006	0.002364
Fujian	0.000507	0.000061	0.007795
Jiangxi	0.000528	0.000017	0.004169
Shandong	0.000312	0.000260	0.016126
Henan	0.000316	0.000062	0.007893
Hubei	0.001011	0.000124	0.011134
Hunan	0.000113	0.000008	0.002827
Guangdong	0.000313	0.001010	0.031788
Guangxi	0.000306	0.000041	0.006410
Hainan	0.000069	0.000000	0.000528
Chongqing	0.000000	0.000000	0.000016
Sichuan	0.000251	0.000066	0.008122
Guizhou	0.000156	0.000002	0.001230
Yunnan	0.000040	0.000007	0.002589
Shaanxi	0.001244	0.000075	0.008649

Gansu	0.000000	0.000000	0.000000
Qinghai	0.000002	0.000000	0.000008
Ningxia	0.001396	0.000007	0.002643
Xinjiang	0.000149	0.000008	0.002911

**Table S9.** Sample learning and prediction accuracy comparison (precipitation forecasting NOH (10,000 people)).

Region	MPE	MSE	SDE
China	0.000121	1584.344982	39.803831
Beijing	0.001689	19.076299	4.367642
Tianjin	0.000245	1.713238	1.308907
Hebei	0.004611	370.160030	19.239543
Shanxi	0.000355	23.198834	4.816517
Inner Mongolia	0.000227	4.596486	2.143942
Liaoning	0.000396	34.112284	5.840572
Jilin	0.001430	21.209976	4.605429
Heilongjiang	0.002159	81.322054	9.017874
Shanghai	0.000046	2.030433	1.424933
Jiangsu	0.000426	7.774070	2.788202
Zhejiang	0.000000	0.000000	0.000515
Anhui	0.000194	9.486102	3.079952
Fujian	0.001784	69.433223	8.332660
Jiangxi	0.001406	11.782794	3.432607
Shandong	0.000274	316.463392	17.789418
Henan	0.000963	111.124734	10.541572
Hubei	0.000932	43.724231	6.612430
Hunan	0.000548	18.438753	4.294037
Guangdong	0.000449	120.761869	10.989171
Guangxi	-0.000071	20.839091	4.564985
Hainan	0.000054	0.046119	0.214754
Chongqing	-0.000257	8.732400	2.955063
Sichuan	0.000000	0.000000	0.000233
Guizhou	0.000267	2.703736	1.644304
Yunnan	0.000704	60.457944	7.775471
Shaanxi	0.000056	2.661778	1.631496
Gansu	0.000000	0.000000	0.000130
Qinghai	0.014937	5.599743	2.366378
Ningxia	0.002009	2.335538	1.528247
Xinjiang	0.001669	39.287940	6.268009

**Table S10.** Sample learning and prediction accuracy comparison (sunshine forecasting VTH).

Region	MPE	MSE	SDE
China	0.000165	0.001513	0.038903
Beijing	0.000882	0.000330	0.018173
Tianjin	0.000074	0.000003	0.001620
Hebei	0.001361	0.000250	0.015825
Shanxi	0.000000	0.000000	0.000000
Inner Mongolia	0.000327	0.000007	0.002645
Liaoning	0.000374	0.000053	0.007292

Jilin	0.000000	0.000000	0.000000
Heilongjiang	0.001443	0.000120	0.010948
Shanghai	0.000068	0.000054	0.007322
Jiangsu	0.000083	0.000093	0.009654
Zhejiang	0.000208	0.000087	0.009320
Anhui	0.000127	0.000009	0.003052
Fujian	0.000553	0.000049	0.007027
Jiangxi	0.000325	0.000012	0.003467
Shandong	0.000040	0.000006	0.002366
Henan	0.000154	0.000049	0.007002
Hubei	0.000408	0.000042	0.006493
Hunan	0.001044	0.000068	0.008268
Guangdong	0.000454	0.001836	0.042854
Guangxi	0.000438	0.000063	0.007935
Hainan	0.000000	0.000000	0.000003
Chongqing	0.000000	0.000000	0.000006
Sichuan	0.000247	0.000109	0.010424
Guizhou	0.002262	0.000067	0.008161
Yunnan	0.000029	0.000003	0.001842
Shaanxi	0.000000	0.000000	0.000000
Gansu	0.001400	0.000045	0.006739
Qinghai	0.000091	0.000000	0.000626
Ningxia	0.001394	0.000007	0.002728
Xinjiang	0.000349	0.000022	0.004742

Table S11. Sample learning and prediction accuracy comparison (sunshine forecasting OWT (100 million)).

Region	MPE	MSE	SDE
China	0.000146	0.001499	0.038719
Beijing	0.000593	0.000310	0.017600
Tianjin	0.000193	0.000012	0.003432
Hebei	0.000088	0.000004	0.001979
Shanxi	0.000678	0.000042	0.006481
Inner Mongolia	0.000451	0.000008	0.002835
Liaoning	0.000040	0.000001	0.001182
Jilin	0.002646	0.000118	0.010863
Heilongjiang	0.000909	0.000061	0.007821
Shanghai	0.000050	0.000053	0.007314
Jiangsu	0.000050	0.000048	0.006942
Zhejiang	0.000078	0.000032	0.005692
Anhui	0.000157	0.000046	0.006777
Fujian	0.000522	0.000038	0.006196
Jiangxi	0.000419	0.000017	0.004170
Shandong	0.000017	0.000001	0.001011
Henan	0.000151	0.000042	0.006507
Hubei	0.000342	0.000027	0.005175
Hunan	0.001053	0.000064	0.008024
Guangdong	0.000446	0.001672	0.040890
Guangxi	0.000250	0.000031	0.005544
Hainan	0.000171	0.000001	0.000925



<b>Chongqing</b>	0.000218	0.000030	0.005504
<b>Sichuan</b>	0.000277	0.000115	0.010725
<b>Guizhou</b>	0.000411	0.000007	0.002733
<b>Yunnan</b>	0.000051	0.000005	0.002182
<b>Shaanxi</b>	0.000026	0.000000	0.000634
<b>Gansu</b>	0.001853	0.000052	0.007244
<b>Qinghai</b>	0.002072	0.000004	0.002106
<b>Ningxia</b>	0.001103	0.000006	0.002353
<b>Xinjiang</b>	0.000446	0.000025	0.004955

**Table S12.** Sample learning and prediction accuracy comparison (sunshine forecasting NOH (10,000 people)).

<b>Region</b>	<b>MPE</b>	<b>MSE</b>	<b>SDE</b>
<b>China</b>	0.000043	270.196617	16.437658
<b>Beijing</b>	0.001227	18.586989	4.311263
<b>Tianjin</b>	0.000272	2.179508	1.476316
<b>Hebei</b>	0.004527	335.369559	18.313098
<b>Shanxi</b>	0.000141	35.946415	5.995533
<b>Inner Mongolia</b>	0.000588	11.474070	3.387340
<b>Liaoning</b>	0.000118	13.013918	3.607481
<b>Jilin</b>	0.001620	17.995828	4.242149
<b>Heilongjiang</b>	0.000877	24.101399	4.909318
<b>Shanghai</b>	0.000054	2.678408	1.636584
<b>Jiangsu</b>	0.000455	45.777794	6.765929
<b>Zhejiang</b>	0.000000	0.000000	0.000044
<b>Anhui</b>	-0.000231	35.627764	5.968900
<b>Fujian</b>	0.003298	40.040784	6.327779
<b>Jiangxi</b>	0.000087	1.203376	1.096985
<b>Shandong</b>	0.000533	295.974136	17.203899
<b>Henan</b>	0.000335	35.615976	5.967912
<b>Hubei</b>	0.001495	65.521461	8.094533
<b>Hunan</b>	0.002869	101.089104	10.054308
<b>Guangdong</b>	0.002227	224.810225	14.993673
<b>Guangxi</b>	0.000033	11.781165	3.432370
<b>Hainan</b>	0.000081	0.598349	0.773530
<b>Chongqing</b>	0.000000	0.000001	0.000784
<b>Sichuan</b>	0.000229	182.066516	13.493203
<b>Guizhou</b>	0.000874	21.418014	4.627960
<b>Yunnan</b>	0.000191	17.352971	4.165690
<b>Shaanxi</b>	0.000026	2.512223	1.584999
<b>Gansu</b>	0.002432	28.259861	5.316001
<b>Qinghai</b>	0.017046	7.760332	2.785737
<b>Ningxia</b>	0.001664	2.053189	1.432895
<b>Xinjiang</b>	0.000907	18.915541	4.349200

**Table S13.** Sample learning and prediction accuracy comparison (four indicators forecasting VTH).

<b>Region</b>	<b>MPE</b>	<b>MSE</b>	<b>SDE</b>
<b>China</b>	0.000811	0.010810	0.103971
<b>Beijing</b>	0.001013	0.000203	0.014242

Tianjin	0.000000	0.000000	0.000000
Hebei	0.001254	0.000258	0.016048
Shanxi	0.000000	0.000000	0.000002
Inner Mongolia	0.000003	0.000000	0.000031
Liaoning	0.000623	0.000056	0.007515
Jilin	0.000000	0.000000	0.000000
Heilongjiang	0.000485	0.000020	0.004454
Shanghai	0.000000	0.000000	0.000036
Jiangsu	0.000639	0.000819	0.028615
Zhejiang	0.004995	0.003639	0.060321
Anhui	0.000000	0.000000	0.000000
Fujian	0.000000	0.000000	0.000017
Jiangxi	0.000563	0.000055	0.007400
Shandong	0.000310	0.000332	0.018208
Henan	0.000000	0.000000	0.000000
Hubei	0.000000	0.000000	0.000000
Hunan	0.000672	0.000058	0.007636
Guangdong	0.000290	0.000888	0.029797
Guangxi	0.000443	0.000037	0.006108
Hainan	0.000000	0.000000	0.000000
Chongqing	0.000970	0.000028	0.005302
Sichuan	0.000379	0.000160	0.012652
Guizhou	0.000000	0.000000	0.000000
Yunnan	0.000001	0.000000	0.000132
Shaanxi	0.000706	0.000044	0.006650
Gansu	0.001845	0.000058	0.007648
Qinghai	0.000000	0.000000	0.000000
Ningxia	0.001917	0.000007	0.002560
Xinjiang	0.000226	0.000011	0.003317

**Table S14.** Sample learning and prediction accuracy comparison (four indicators forecasting OWT (100 million)).

Region	MPE	MSE	SDE
China	0.000651	0.010340	0.101683
Beijing	0.001128	0.000240	0.015485
Tianjin	0.000000	0.000000	0.000000
Hebei	0.001368	0.000220	0.014841
Shanxi	0.000000	0.000000	0.000004
Inner Mongolia	0.000001	0.000000	0.000011
Liaoning	0.000342	0.000018	0.004298
Jilin	0.001028	0.000049	0.007010
Heilongjiang	0.000213	0.000005	0.002254
Shanghai	0.000000	0.000000	0.000003
Jiangsu	0.000022	0.000019	0.004314
Zhejiang	0.005363	0.003790	0.061564
Anhui	0.000207	0.000008	0.002796
Fujian	0.000000	0.000000	0.000008
Jiangxi	0.000000	0.000000	0.000000
Shandong	0.000242	0.000296	0.017211
Henan	0.000000	0.000000	0.000000

Hubei	0.000000	0.000000	0.000000
Hunan	0.000563	0.000057	0.007576
Guangdong	0.000280	0.000776	0.027856
Guangxi	0.000295	0.000018	0.004296
Hainan	0.000197	0.000001	0.001000
Chongqing	0.001036	0.000028	0.005333
Sichuan	0.000414	0.000149	0.012222
Guizhou	0.000000	0.000000	0.000000
Yunnan	0.000000	0.000000	0.000015
Shaanxi	0.000748	0.000037	0.006109
Gansu	0.001971	0.000053	0.007294
Qinghai	0.002579	0.000004	0.001918
Ningxia	0.001461	0.000008	0.002795
Xinjiang	0.000110	0.000004	0.001999

**Table S15.** Sample learning and prediction accuracy comparison (four indicators forecasting NOH: 10,000 people).

Region	MPE	MSE	SDE
China	0.000002	0.066784	0.258426
Beijing	0.000644	10.606083	3.256698
Tianjin	0.004849	4.744277	2.178136
Hebei	0.001584	190.051158	13.785904
Shanxi	0.000215	9.629034	3.103069
Inner Mongolia	0.000001	0.001251	0.035367
Liaoning	0.000000	0.000000	0.000585
Jilin	0.001054	9.280906	3.046458
Heilongjiang	0.000748	17.888213	4.229446
Shanghai	0.000118	3.459122	1.859871
Jiangsu	0.000402	21.905976	4.680382
Zhejiang	0.000128	8.231969	2.869141
Anhui	0.000517	29.993593	5.476641
Fujian	0.002244	79.058099	8.891462
Jiangxi	0.000000	0.000000	0.000111
Shandong	0.000287	205.890915	14.348899
Henan	0.000000	0.000030	0.005500
Hubei	0.008690	255.397376	15.981157
Hunan	0.001632	59.442125	7.709872
Guangdong	0.001153	80.864327	8.992459
Guangxi	0.000312	0.968018	0.983879
Hainan	0.003177	1.927869	1.388477
Chongqing	0.000000	0.000000	0.000210
Sichuan	0.000348	173.464960	13.170610
Guizhou	0.000000	0.000000	0.000264
Yunnan	0.000694	44.667220	6.683354
Shaanxi	0.000000	0.000452	0.021260
Gansu	0.002734	24.762121	4.976155
Qinghai	0.012505	6.635588	2.575964
Ningxia	0.002133	1.081430	1.039918
Xinjiang	0.003732	46.643747	6.829623