Supplemental Data

Supplemental Data 1. The decomposition process of the Thiel index

$$T = T_{intra} + T_{inter}$$

$$T_{intra} = \sum_{g=1}^{k} P_g T_g$$

$$T_{inter} = \sum_{g=1}^{k} P_g \log \frac{P_g}{Y_g}$$

In the above formula, T_{intra} denotes the distribution of health resources within the four regions of Chongqing, and T_{inter} denotes the distribution of health resources among the four regions of Chongqing. P_g denotes the proportion of population or geographical area or GDP of the four regions of Chongqing to the city. Y_g denotes the proportion of health resources of the four regions of Chongqing to the city. The formulae for the contribution rates within and between regions and across regions are as follows.

Intra-regional contribution rate =T_{intra}/T
Inter-regional contribution rate=T_{inter}/T
Contribution rate of different regions=$P_g T_g/T$

Supplemental Data 2. Steps for solving problems using the AHP method

1. Develop a hierarchy that outlines the objective, potential solutions, main indicator, and sub-indicator for the thorough assessment.
2. Construct a pair-wise comparison matrix for the decision-making objective's indicator and alternatives by using the basic pair-wise comparison scale presented in Supplemental Table 1.

3. Calculate the matching Eigenvectors to the maximum Eigen values of comparison to determine the relative importance of factors.
4. The Consistency Index (CI), and the Consistency Ratio (CR) was used to evaluate the validity of the results and the consistency of responses.

$$CI=\frac{\lambda_{max}-n}{n-1};\ CR=\frac{CI}{RCI}\ ;$$

where λ_{max} is the Eigen value corresponding to the matrix of pair-wise comparisons. n is the number of elements being compared. RCI is a random consistency index for the appropriate value of n.

The CR value of all pair-wise comparison matrix being 0.1 or below indicates that the judgments are acceptable.

Supplemental Data 3. Steps for solving problems using the TOPSIS method

1. Establish a normalized decision matrix using the following equation.

$$z_{ij}=\frac{x_{ij}}{\sqrt{\sum_{j=1}^{m}x_{ij}^2}}\quad i=1,2,\ldots.,m;j=1,2,\ldots,n$$

2. Calculate the weighted normalized decision matrix by multiplying the normalized decision matrix with its weights obtained through the AHP method.
3. Determine the positive ideal solution Z^+ and negative ideal solution Z^- of the evaluation object.

$$Z^+=(Z_1^+,Z_2^+,\cdots,Z_m^+)=(\max\{z_{11},z_{21},\cdots,z_{n1}\},\max\{z_{12},z_{22},\cdots,z_{n2}\},\cdots,\max\{z_{1m},z_{2m},\cdots,z_{nm}\})$$

$$Z^-=(Z_1^-,Z_2^-,\cdots,Z_m^-)$$

$$=(\min\{z_{11},z_{21},\cdots,z_{n1}\},\min\{z_{12},z_{22},\cdots,z_{n2}\},\cdots,\min\{z_{1m},z_{2m},\cdots,z_{nm}\})$$

4. Determine the Euclidean distance of the evaluation object from the positive(Z^+) and negative ideal solutions(Z^-) using the following equation.

$$D_i^+=\sqrt{\sum_{j=1}^{m}(Z_j^+-z_{ij})^2}$$

$$D_i^- = \sqrt{\sum_{j=1}^{m} (Z_j^- - z_{ij})^2}$$

5. Determine the relative closeness to the ideal solution using the following equation.

$$S_i = \frac{D_i^-}{D_i^+ + D_i^-} \quad 0 \le S_i \le 1$$

6. Rank all options according to the value of S_i, the closer the value of S_i is to 1, the better the medical resources.

Supplemental table and figure

Supplemental Table 1. Scale of pair-wise comparison for AHP

Scale	Definition
1	Equally important
3	Slightly important
5	Significantly important
7	Strongly important
9	Extremely important
2,4,6,8	Moderately important between the above two adjacent scales

Supplemental Table 2a. Number of health resources distribution in Chongqing in 2021

Region/District	Human Resources	Material Resources	Financial Resources

	Health technical personnel	Practicing (assistant) physicians	Registered nurses	Institutions	Hospital beds	Medical equipment*	Health investment (10,000 yuan)
The whole city	246615	92131	114011	21361	240741	242303	2045100
Chongqing main urban district	104552	38315	50934	5924	78497	102816	905400
	(42.39%)	(41.59%)	(44.67%)	(27.73%)	(32.61%)	(42.43%)	(44.27%)
West Chongqing	72081	27427	32904	6930	77595	72433	548300
	(29.23%)	(29.77%)	(28.86%)	(32.44%)	(32.23%)	(29.89%)	(26.81%)
Northeast Chongqing	52133	19821	22460	6339	62152	49943	449000
	(21.14%)	(21.51%)	(19.70%)	(29.68%)	(25.82%)	(20.61%)	(21.95%)
Southeast Chongqing	17849	6568	7713	2168	22497	17111	142400
	(7.24%)	(7.13%)	(6.77%)	(10.15%)	(9.34%)	(7.06%)	(6.96%)
Wanzhou	12933	4994	5755	1304	12078	12357	126800
Qianjiang	3989	1369	1889	311	4489	3989	27300
Fuling	8210	3146	3551	636	7604	7838	43300
Yuzhong	23577	7556	12016	415	16033	37421	283000
Dadukou	3467	1314	1693	247	2985	2333	17800
Jiangbei	12345	4434	6279	477	9365	10081	67000
Shapingba	14283	5470	6821	906	11809	11393	115100
Jiulongpo	11738	4278	5689	760	10088	9343	87700
Nan'an	8583	3351	4078	641	5399	7463	118100
Beibei	5919	2255	2586	423	5067	4972	32200
Yubei	16869	6573	8070	1255	10142	12698	130300
Ba'nan	7771	3084	3702	800	7609	7112	54200
Changshou	4877	1856	2253	444	5565	4714	67200

Jiangjin	7767	3276	3315	592	9554	5407	59500
Hechuan	7803	3047	3606	758	7749	6583	54900
Yongchuan	8008	2847	3851	727	9397	18307	53900
Nanchuan	4311	1520	2091	457	4447	4168	36300
Qijiang	7326	2328	3586	636	9512	6079	37700
Dazu	4935	1965	2121	457	5805	3908	52000
Bishan	4978	1902	2462	513	4470	3741	34100
Tongliang	4748	1892	2131	854	4495	4408	34800
Tongnan	3924	1579	1574	425	4376	2877	27800
Rongchang	5194	2069	2363	431	4621	4403	46800
Kaizhou	7046	2811	2987	752	8432	6894	42400
Liangping	3931	1604	1728	574	4615	7657	29000
Wulong	2025	829	792	359	2844	2112	20000
Chengkou	1330	461	529	174	1302	1344	17100
Fengdu	3424	1133	1508	485	5154	3804	21900
Dianjiang	4244	1640	1803	426	5163	3814	41700
Zhongxian	4134	1547	1827	594	5264	3317	38000
Yunyang	5517	2278	2203	697	8191	4542	41800
Fengjie	4643	1637	2198	556	5636	2367	30200
Wushan	2940	986	1260	414	3911	2341	20700
Wuxi	1991	730	662	363	2406	1506	39400
Shizhu	2765	1050	1233	351	3955	2820	22300
Xiushan	3384	1132	1602	351	3758	2632	29700
Youyang	2835	1061	1068	354	3850	2016	17500
Pengshui	2851	1127	1129	442	3601	3542	25600

* Number of medical equipment (≥ CNY 10,000). Percentage data indicates the proportion of the citywide total.

Supplemental Table 2b. Number of health resources distribution in Chongqing in 2021(Per 1000 persons)

Region/District	Human Resources			Material Resources			Financial Resources
	Health technical personnel	Practicing (assistant) physicians	Registered nurses	Institutions	Hospital beds	Medical equipment*	Health investment (10,000 yuan)
The whole city	7.69	2.87	3.56	0.67	7.51	7.56	63.8
Chongqing main urban district	10.11	3.7	4.92	0.57	7.59	9.94	87.53
West Chongqing	6.69	2.54	3.05	0.64	7.2	6.72	50.87
Northeast Chongqing	6.46	2.46	2.79	0.79	7.71	6.19	55.68
Southeast Chongqing	6.23	2.29	2.69	0.76	7.85	5.97	49.67
Wanzhou	8.27	3.19	3.68	0.83	7.72	7.9	81.05
Qianjiang	8.19	2.81	3.88	0.64	9.21	8.19	56.03
Fuling	7.36	2.82	3.18	0.57	6.82	7.03	38.83
Yuzhong	40.05	12.83	20.41	0.7	27.23	63.56	480.71
Dadukou	8.22	3.11	4.01	0.59	7.08	5.53	42.19
Jiangbei	13.33	4.79	6.78	0.52	10.12	10.89	72.37
Shapingba	9.67	3.7	4.62	0.61	7.99	7.71	77.91
Jiulongpo	7.69	2.8	3.73	0.5	6.61	6.12	57.44
Nan'an	7.17	2.8	3.41	0.54	4.51	6.23	98.61
Beibei	7.09	2.7	3.1	0.51	6.07	5.96	38.57
Yubei	7.7	3	3.68	0.57	4.63	5.79	59.46
Ba'nan	6.59	2.62	3.14	0.68	6.45	6.03	45.98
Changshou	7.04	2.68	3.25	0.64	8.03	6.8	96.98

Jiangjin	5.71	2.41	2.44	0.44	7.03	3.98	43.76
Hechuan	6.27	2.45	2.9	0.61	6.22	5.29	44.09
Yongchuan	6.97	2.48	3.35	0.63	8.18	15.93	46.91
Nanchuan	7.53	2.66	3.65	0.8	7.77	7.28	63.42
Qijiang	7.24	2.3	3.55	0.63	9.41	6.01	37.28
Dazu	5.91	2.35	2.54	0.55	6.96	4.68	62.31
Bishan	6.58	2.52	3.26	0.68	5.91	4.95	45.1
Tongliang	6.92	2.76	3.11	1.25	6.56	6.43	50.75
Tongnan	5.7	2.29	2.29	0.62	6.36	4.18	40.4
Rongchang	7.76	3.09	3.53	0.64	6.91	6.58	69.96
Kaizhou	5.86	2.34	2.48	0.62	7.01	5.73	35.24
Liangping	6.09	2.49	2.68	0.89	7.15	11.87	44.94
Wulong	5.68	2.32	2.22	1.01	7.97	5.92	56.06
Chengkou	6.73	2.33	2.68	0.88	6.59	6.81	86.58
Fengdu	6.14	2.03	2.71	0.87	9.25	6.82	39.29
Dianjiang	6.52	2.52	2.77	0.65	7.93	5.86	64.09
Zhongxian	5.73	2.15	2.53	0.82	7.3	4.6	52.71
Yunyang	5.94	2.45	2.37	0.75	8.82	4.89	44.99
Fengjie	6.23	2.2	2.95	0.75	7.57	3.18	40.55
Wushan	6.36	2.13	2.72	0.9	8.46	5.06	44.76
Wuxi	5.12	1.88	1.7	0.93	6.19	3.87	101.37
Shizhu	7.11	2.7	3.17	0.9	10.17	7.25	57.33
Xiushan	6.82	2.28	3.23	0.71	7.57	5.3	59.86
Youyang	4.67	1.75	1.76	0.58	6.34	3.32	28.81
Pengshui	5.37	2.12	2.13	0.83	6.79	6.68	48.25

* Number of medical equipment (≥ CNY 10,000)

Supplemental Table 2c. Number of health resources distribution in Chongqing in 2021(Per 10000 square kilometers)

Region/District	Human Resources			Material Resources			Financial Resources
	Health technical personnel	Practicing (assistant) physicians	Registered nurses	Institutions	Hospital beds	Medical equipment*	Health investment (10,000 yuan)
The whole city	2993.99	1118.50	1384.13	259.33	2922.68	2941.64	24828.21
Chongqing main urban district	19124.20	7008.41	9316.63	1083.59	14358.33	18806.66	165611.85
West Chongqing	3108.55	1182.81	1419.01	298.86	3346.34	3123.73	23645.85
Northeast Chongqing	1537.80	584.67	662.52	186.99	1833.34	1473.20	13244.45
Southeast Chongqing	900.83	331.48	389.27	109.42	1135.41	863.58	7186.84
Wanzhou	3745.44	1446.28	1666.67	377.64	3497.83	3578.63	36721.69
Qianjiang	1669.04	572.80	790.38	130.13	1878.24	1669.04	11422.59
Fuling	2791.57	1069.70	1207.41	216.25	2585.52	2665.08	14722.88
Yuzhong	1025086.96	328521.74	522434.78	18043.48	697086.96	1627000.00	12304347.83
Dadukou	33660.19	12757.28	16436.89	2398.06	28980.58	22650.49	172815.53
Jiangbei	55859.73	20063.35	28411.76	2158.37	42375.57	45615.38	303167.42
Shapingba	36068.18	13813.13	17224.75	2287.88	29820.71	28770.20	290656.57
Jiulongpo	27234.34	9925.75	13199.54	1763.34	23406.03	21677.49	203480.28
Nan'an	32759.54	12790.08	15564.89	2446.56	20606.87	28484.73	450763.36
Beibei	7881.49	3002.66	3443.41	563.25	6747.00	6620.51	42876.17
Yubei	11577.90	4511.32	5538.78	861.36	6960.88	8715.17	89430.34
Ba'nan	4262.75	1691.72	2030.72	438.84	4173.89	3901.26	29731.21
Changshou	3432.09	1306.12	1585.50	312.46	3916.26	3317.38	47290.64

Jiangjin	2415.11	1018.66	1030.78	184.08	2970.77	1681.28	18501.24
Hechuan	3330.35	1300.47	1539.05	323.52	3307.30	2809.65	23431.50
Yongchuan	5071.56	1803.04	2438.89	460.42	5951.23	11594.05	34135.53
Nanchuan	1665.12	587.10	807.65	176.52	1717.65	1609.89	14020.86
Qijiang	2666.91	847.47	1305.42	231.53	3462.69	2212.96	13724.06
Dazu	3441.42	1370.29	1479.08	318.69	4048.12	2725.24	36262.20
Bishan	5440.44	2078.69	2690.71	560.66	4885.25	4088.52	37267.76
Tongliang	3540.64	1410.89	1589.11	636.84	3351.98	3287.10	25950.78
Tongnan	2475.71	996.21	993.06	268.14	2760.88	1815.14	17539.43
Rongchang	4822.66	1921.08	2194.06	400.19	4290.62	4088.21	43454.04
Kaizhou	1777.50	709.13	753.53	189.71	2127.14	1739.15	10696.27
Liangping	2082.10	849.58	915.25	304.03	2444.39	4055.61	15360.17
Wulong	700.21	286.65	273.86	124.14	983.40	730.29	6915.63
Chengkou	404.38	140.16	160.84	52.90	395.87	408.63	5199.15
Fengdu	1181.10	390.82	520.18	167.30	1777.85	1312.18	7554.33
Dianjiang	2797.63	1081.08	1188.53	280.82	3403.43	2514.17	27488.46
Zhongxian	1890.26	707.36	835.39	271.60	2406.95	1516.69	17375.40
Yunyang	1517.33	626.51	605.89	191.69	2252.75	1249.17	11496.15
Fengjie	1132.99	399.46	536.36	135.68	1375.31	577.60	7369.45
Wushan	994.92	333.67	426.40	140.10	1323.52	792.22	7005.08
Wuxi	495.89	181.82	164.88	90.41	599.25	375.09	9813.20
Shizhu	917.39	348.37	409.09	116.46	1312.21	935.63	7398.81
Xiushan	1379.54	461.48	653.08	143.09	1532.00	1072.97	12107.62
Youyang	548.57	205.30	206.66	68.50	744.97	390.09	3386.22
Pengshui	731.59	289.20	289.71	113.42	924.04	908.90	6569.16

* Number of medical equipment (≥ CNY 10,000)

Supplemental Table 3a. The comparison matrix of indicator (CR: Consistency Ratio)

Indicator no	Human Resources	Material Resources	Financial Resources
Human Resources	1	0.68	0.45
Material Resources	1.47	1	0.27
Financial Resources	2.2	3.70	1
CR			0.08

Supplemental Table 3b. The comparison matrix of sub-indicator with respect to indicator C1 (CR: Consistency Ratio)

	Health technical personnel	Practicing (assistant) physicians	Registered nurses
Health technical personnel	1	0.25	0.2
Practicing (assistant) physicians	4	1	0.33
Registered nurses	5	3	1
CR			0.08

Supplemental Table 3c. The comparison matrix of sub-indicator with respect to indicator C2 (CR: Consistency Ratio)

	Institutions	Hospital beds	Medical equipment (≥ CNY 10,000)
Institutions	1	0.25	0.49
Hospital beds	4	1	0.89
Medical equipment (≥ CNY 10,000)	2.05	1.12	1
CR			0.07