Favorable Trends of Lung Cancer Mortality-to-Incidence Ratios in Countries With High Computed Tomography Density

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Research

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Abstract

Background: Prognoses for lung cancer deteriorate dramatically with the progression of cancer stages. Therefore, early screening by techniques such as low-dose computed tomography (LDCT) is critical. However, the epidemiology regarding the association between the popularization of CT and the prognosis for lung cancer is not known.

Methods: Data were obtained from GLOBOCAN and the health data and statistics of World Health Organization. MIRs and the changes in MIR over time (δ MIR), which were calculated as the difference between MIRs in 2018 and 2012, were used to evaluate the correlation to CT density disparities via Spearman's rank correlation coefficient.

Results: Countries with zero CT density presented a relatively low incidence crude rate and a relatively high MIR in 2018 and a negative δ MIR. Conversely, countries with CT density over 30 had a positive δ MIR. The CT density was significantly associated with human development index (HDI) score and MIR in 2018 but demonstrated no association with MIR in 2012. The linear correlation between CT density and δ MIR also shows a significant association.

Conclusion: CT density was significantly associated with MIR in 2018 and with δ MIR, indicating favorable clinical outcomes in countries with popularization of CT.

Introduction

Lung cancer used to be a rare disease; however, since the start of the 21st century, it has become the cancer with the highest incidence and mortality worldwide. In 2018, the number of new cases of lung cancer was as high as 2,093,876 and deaths due to lung cancer totaled 1,761,007 [1]. These data are strikingly high and have aroused public concern. Moreover, mortality rates in 2018 closely paralleled the incidence rate in lung cancer worldwide, meaning a poor treatment outcome for lung cancer after diagnosis [1]. Lung cancer is usually diagnosed in advanced stages [2], and the prognosis at this period is extremely poor. Therefore, early diagnosis is a true public concern.

If lung cancer can be diagnosed early, the five-year survival rate can rise to 60–80%, much higher than in stage 3 (16%) and stage 4 (less than 10%) [3]. Unfortunately, early diagnosis becomes quite difficult because lung cancer in its early stage is asymptomatic and its detection depends on image surveys, such as X-ray or CT. However, compared to CT screening, the use of X-rays to find abnormalities in lung cancer, and especially small lesions, is far more difficult. In 90% of early lung cancer cases, a misdiagnosis occurs when X-rays are used [4], due to the difficulty in distinguishing lung lesions from bones, pulmonary vessels, mediastinal structures, and other complex anatomical structures [4]. Conversely, CT has high sensitivity and can distinguish 83% to 91% of these lesions [5].

Low-dose computed tomography (LDCT), as the name suggests, allows screening at a lower radiation dose (1.0–1.4mSV) compared to traditional CT [6]. Moreover, related research showed no significant differences between LDCT and CT when used for lung cancer screening, as the concordance rate for the diagnoses was approximately 80% [7]. CT mainly detects lung nodules and establishes baseline screening for lung cancer [8]. However, the CT density, defined as the total density of CT facilities per million population, varies dramatically from region to region. CT facilities require abundant funds, so their construction might be influenced by the economic development of a given country. Based on the important role of LDCT in lung cancer prognosis and the regional differences in CT density, we considered that CT density might affect the worldwide mortality-to-incidence ratios (MIRs). Many previous studies have focused on the effectiveness of LDCT by analyzing the correlation between regular LDCT screening and lung cancer mortality rates, whereas few studies have explored the real situation regarding the availability of LDCT worldwide. Here, we have provided a comprehensive view of the relevance of CT availability to lung cancer prognosis according to regions by analyzing the association between CT density and MIRs.

Materials And Methods

Lung cancer (ICD-10 C33-34) epidemiological data were obtained from the GLOBOCAN database (<https://gco.iarc.fr/today/>) estimates from 2012 and 2018 for 185 countries. The human development index (HDI) was obtained from the United Nations Development Programme, Human Development Report Office (<http://hdr.undp.org/en>). Data for CT density for 2013 were obtained from the Global Health Observatory data repository (<https://www.who.int/data/gho>). The data on health expenditures, including per capita current health expenditure (CHE) and current health expenditure on gross domestic product (CHE/GDP) (ratio of CHE to the % of GDP), were obtained from the World Health Statistics database (https://www.who.int/gho/publications/world_health_statistics/en/). MIR was defined as the ratio of the crude rate of mortality to the crude rate of incidence, as previously described [9-12]. The MIR over time (δ MIR) was defined as the difference between the MIRs of 2012 and 2018 (δ MIR = MIR [in 2012] - MIR [in 2018]) [13].

The exclusion criteria for country selection included data missing for the CT density (N = 60), missing data for MIR/HDI/CHE (N = 3), and outliers for the CT density (N = 2). A total of 115 countries were included in the final analysis.

The associations between the MIR, δ MIR, and other factors among the various countries were estimated using a Spearman's rank correlation coefficient calculated using SPSS statistical software version 15.0 (SPSS, Inc., Chicago, IL). Values of $p < 0.05$ were considered statistically significant. Scatterplots were generated using SigmaPlot.

Result

Human development index and the CT density in selected countries

Table 1 demonstrates the scores and ranks for the human development index and the CT density according to countries. Countries with a CT density less than 0.01 are the African Republic, Guinea-Bissau, Guinea, and Vanuatu. As expected, these countries also rank low in terms of HDI (187, 174, 176, and 122, respectively). By contrast, countries with CT density higher than 20 all rank in the top 50, except for Lebanon. The highest CT density is in Iceland (39.45), and the lowest CT density are in Guinea-Bissau and Guinea (0.00).

CT density and incidence crude rates, MIR, and MIR disparity of lung cancer

Those countries with zero CT density, namely the African Republic, Guinea-Bissau, Guinea, and Vanuatu, also have a incidence crude rate lower than 10 (2.2, 2.8, 2.4 and 8.0, respectively). Furthermore, their MIR in 2018 was higher than 0.9 and the δ MIR values were all negative. In terms of δ MIR, countries with a CT density over 30, such as Iceland, Greece, and South Korea, have a positive δ MIR (0.15, 0.12, and 0.11, respectively). Conversely, Vanuatu had an extremely low δ MIR (-0.14) and the highest MIR in 2018 (1.06) and had a CT density of zero.

CT density is significantly associated with HDI score.

Figure 1 presents the association between CT density and HDI score according to all selected countries, grouped according to HDI score (<0.70 and >0.70, respectively). All three groups show a significant association between CT density and HDI ($\rho=0.867$, $p<0.001$, Figure 1A; $\rho=0.651$, $p<0.001$, Figure 1B; $\rho=0.508$, $p<0.001$, Figure 1C, respectively).

The association between CT density, MIR in 2012 and 2018, and δ MIR.

The CT density is significantly associated with MIR in 2018 in figure 2 ($\rho=-0.581$, $p<0.001$, Figure 2B) However, no association was noted between CT density and MIR in 2012 ($\rho=-0.104$, $p=0.268$, Figure 2A). However, analysis of the linear correlation between CT density and δ MIR revealed a significant association ($\rho=0.455$, $p<0.001$, Figure 2C).

Discussion

The previous large National Lung Screening Trial (NLST) with an enrolment of 53,454 persons, focused on the effect of routine LDCT screening on mortality reduction, but only concluded that ever-smokers were at high risk [14, 15]. Our study, also based on the NLST, generally explored the association between CT density distribution and the prognosis of lung cancer and revealed the concordance between the geographical distribution of actual CT density and prognosis of lung cancer. Adequate CT facilities might better meet the needs of people eligible for routine screening, thereby improving the prognosis of lung cancer.

According to the NLST, the LDCT can reduce lung cancer mortality by 20% compared to X-rays, and follow-up European studies also support the effectiveness of LDCT [16, 17]. LDCT mainly detects nodules in the lung. The size, growth rate, morphology, and location of the nodules are references used for malignant or benign judgments. Related research shows that most lung cancer is confirmed in large nodules, whereas lung nodule counts have yet to be proved to determine malignancy [18]. Compared to the high misdiagnosis rate and the increased cost and time-consuming shortcomings of MIRs, regular LDCT screening might be a more practicable form of radiography for close tracking of new large nodules [4, 19]. Due to the effectiveness of LDCT screening, the United States recommends that current and former smokers aged 55 through 80 years with a 30-year history of smoking receive routine LDCT screening [20].

The recommendation for LDCT screening of high-risk people was based on NLST research and was announced in 2011 [14, 20]. This might explain the lack of a significant association between CT density and MIR in 2012 in our analysis and the subsequent significant association in 2018. Furthermore, CT density is also significantly associated with HDI. According to previous research on the cost-effectiveness of CT, which has an incremental cost-effectiveness ratio (ICER) of £10,069 per quality-adjusted life year (QALY) [21]. This number might be an imposing burden for low-HDI countries. In other words, the CT density might also reflect the amount of money invested in medical care.

To the best of our knowledge, our study is the first to aim at identifying an association between CT density and the MIRs of lung cancer. However, this study still has some limitations. One is that only countries with a CT density recorded by the WHO were included in our study. Another is that the level of CT density might not be representative of the people that actually receive routine screening. A third limitation is that previous research showed no significant association between LDCT and the decrease in lung cancer mortality rates in males, meaning that the study might ignore sexual differences [5]. Despite these limitations, our study still demonstrates that the prognosis of lung cancer might improve as the CT density rises.

Abbreviations

Low-dose computed tomography, LDCT; Mortality-to-incidence ratios, MIRs; Human development index, HDI; Current health expenditure, CHE; Current health expenditure on gross domestic product, CHE/GDP; MIR over time, δ MIR; National Lung Screening Trial, NLST; Incremental cost-effectiveness ratio, ICER; Quality-adjusted life year, QALY

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The datasets [Cancer epidemiological data] for this study can be found in the [GLOBOCAN project] [<http://gco.iarc.fr/>]. The datasets [HDI data] for this study can be found in the [Human Development Report Office of the United Nations Development Programme] [<http://hdr.undp.org/en>]. The datasets [Health expenditures data] for this study can be found in the [World Health Statistics database] [https://www.who.int/gho/publications/world_health_statistics/en/].

Conflicts of Interest

The authors declare no conflict of interest.

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Author contributions

Conceptualization, Yao-Tung Wang, Han-Ru Wu, and Wen-Wei Sung; Data curation, Ya-Chuan Chang, and Chia-Ying Yu; Formal analysis, Ya-Chuan Chang, and Chia-Ying Yu; Methodology, Han-Ru Wu, and Wen-Wei Sung; Supervision, Yao-Chen Wang, and Wen-Wei Sung; Writing – original draft, Han-Ru Wu and Wen-Wei Sung; Writing – review & editing, Yao-Tung Wang and Yao-Chen Wang.

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Tables

Table 1. Summary of human development index, CT density, cancer incidence, cancer mortality, and mortality-to-incidence ratio in lung cancer of selected countries.

	Human Development Index			Incidence			Mortality			Mortality-to-incidence Ratio		
Country	Score	Rank	CT density	Number	ASR	CR	Number	ASR	CR	2012	2018	δMIR
Afghanistan	0.479	153	0.20	1019	2.8	6.1	1022	2.8	6.1	0.87	1.00	-0.13
Albania	0.771	61	5.36	1087	37.4	21.1	961	33.1	18.1	0.95	0.89	0.06
Angola	0.537	135	0.42	401	1.3	3.2	396	1.3	3.2	0.88	1.00	-0.12
Armenia	0.737	75	3.02	1266	43.7	27.8	1186	40.9	26.1	0.90	0.94	-0.04
Austria	0.899	15	28.49	4845	56.9	27.3	4012	47.1	21.1	0.80	0.83	-0.03
Azerbaijan	0.736	78	1.06	1346	13.6	12.5	1265	12.8	11.7	0.88	0.94	-0.06
Bahamas	0.797	51	13.25	33	8.3	6.1	32	8.1	6.0	0.93	0.98	-0.05
Barbados	0.811	44	7.03	46	16.3	8.7	41	14.5	7.6	1.00	0.89	0.11
Belarus	0.803	46	6.20	4118	44.3	25.0	2839	30.5	17.0	0.85	0.69	0.16
Belize	0.706	90	12.05	25	6.6	9.8	25	6.6	9.8	0.96	1.00	-0.04
Benin	0.489	149	0.29	65	0.6	1.0	64	0.6	1.0	1.00	0.98	0.02
Bhutan	0.591	120	1.33	48	5.9	7.9	44	5.4	7.3	0.94	0.92	0.02
Bosnia and Herzegovina	0.741	73	16.45	2379	69.1	35.9	2034	59.0	29.5	1.01	0.85	0.16
Botswana	0.687	96	0.99	45	1.9	2.9	44	1.9	2.9	0.91	1.00	-0.09
Burkina Faso	0.394	170	0.65	243	1.2	2.7	231	1.2	2.6	0.89	1.00	-0.11
Burundi	0.416	166	0.20	86	0.8	1.6	81	0.7	1.6	0.89	0.94	-0.05
Cambodia	0.548	129	1.19	1544	9.5	13.0	1497	9.2	12.6	0.88	0.97	-0.09
Cameroon	0.524	138	0.63	294	1.2	2.3	293	1.2	2.3	0.89	1.00	-0.11
Canada	0.906	12	13.76	22340	61.9	28.4	17566	48.7	21.7	0.79	0.79	0.00
Central African Republic	0.370	172	0.00	56	1.2	2.2	54	1.1	2.1	0.89	0.92	-0.03
Chad	0.393	171	0.08	102	0.7	1.5	95	0.6	1.5	0.83	0.93	-0.10
Chile	0.818	43	12.60	3432	19.1	12.5	3163	17.6	11.5	0.96	0.92	0.04
Comoros	0.529	137	1.36	1	0.1	0.2	1	0.1	0.2	1.00	1.00	0.00
Costa Rica	0.774	59	5.13	405	8.3	6.1	335	6.8	4.9	0.70	0.82	-0.12
Côte d'Ivoire	0.467	155	0.69	276	1.1	2.2	267	1.1	2.2	0.90	1.00	-0.10
Croatia	0.820	42	14.92	2817	69.3	31.7	2684	66.0	29.7	0.91	0.95	-0.04
Cuba	0.764	66	4.79	6318	56.1	29.9	5267	46.8	24.5	0.94	0.83	0.11
Cyprus	0.852	30	25.41	454	38.7	23.0	456	38.9	22.7	0.93	1.01	-0.08
Czechia	0.865	26	12.99	6204	59.6	26.5	4821	46.3	20.2	0.78	0.78	0.00
Denmark	0.924	5	23.85	4546	80.8	35.2	3487	62.0	25.5	0.83	0.77	0.06
Dominican Republic	0.708	89	13.89	1236	11.5	11.7	1106	10.2	10.3	0.90	0.89	0.01
Ecuador	0.740	74	1.59	965	5.8	5.5	888	5.3	5.0	1.01	0.91	0.10
El Salvador	0.660	107	4.73	362	5.7	4.9	343	5.4	4.6	0.89	0.95	-0.06
Eritrea	0.422	165	0.32	79	1.5	2.8	77	1.5	2.8	0.91	1.00	-0.09
Estonia	0.859	27	15.54	790	62.1	28.8	653	51.3	22.7	1.05	0.83	0.22
Eswatini/Swaziland	0.542	133	2.40	18	1.3	2.5	18	1.3	2.6	1.00	1.00	0.00

Ethiopia	0.429	163	0.36	2033	1.9	3.5	2032	1.9	3.5	0.89	1.00	-0.11
Fiji	0.702	91	3.40	54	5.9	5.9	51	5.6	5.6	0.88	0.95	-0.07
Finland	0.908	9	20.09	2480	46.0	18.4	2035	37.7	14.7	0.86	0.82	0.04
Gabon	0.672	103	3.59	95	4.6	6.7	92	4.5	6.6	0.93	0.98	-0.05
Georgia	0.749	69	8.75	1148	29.8	16.7	1070	27.8	15.9	0.90	0.93	-0.03
Ghana	0.570	124	0.15	234	0.8	1.4	217	0.7	1.3	0.86	0.93	-0.06
Greece	0.856	28	33.16	9229	85.6	39.6	7498	69.5	30.8	0.93	0.81	0.12
Guinea-Bissau	0.437	161	0.00	18	0.9	1.8	18	0.9	1.8	1.00	1.00	0.00
Guinea	0.431	162	0.00	184	1.4	2.4	165	1.3	2.2	0.88	0.93	-0.05
Guyana	0.652	108	3.75	21	2.7	3.0	21	2.7	3.0	0.94	1.00	-0.06
Haiti	0.478	154	0.29	491	4.4	5.9	441	4.0	5.4	0.91	0.91	0.00
Honduras	0.600	118	2.10	363	3.9	5.5	321	3.4	4.8	0.93	0.87	0.06
Hungary	0.826	39	6.63	10550	111.1	55.8	8457	89.0	43.5	0.87	0.80	0.07
Iceland	0.908	10	39.45	174	52.5	29.6	125	37.7	19.4	0.87	0.72	0.15
Iraq	0.662	106	2.22	2075	5.3	10.4	2019	5.1	10.1	0.90	0.96	-0.06
Ireland	0.899	16	4.54	2694	56.9	31.8	1778	37.6	20.2	0.78	0.66	0.12
Israel	0.893	19	7.50	2304	27.7	20.1	1997	24.0	17.1	0.86	0.87	-0.01
Jamaica	0.722	84	1.44	481	16.8	13.2	439	15.3	11.9	0.90	0.91	-0.01
Jordan	0.726	83	5.50	1093	11.1	17.3	972	9.8	15.6	0.90	0.88	0.02
Kazakhstan	0.782	57	1.46	4239	23.1	21.3	3798	20.7	19.1	0.90	0.90	0.00
Kenya	0.545	132	0.25	665	1.3	2.9	651	1.3	2.9	0.92	1.00	-0.08
Kyrgyzstan	0.649	109	0.90	657	10.7	13.9	606	9.9	12.7	0.89	0.93	-0.04
Laos	0.569	125	0.74	861	12.4	18.3	829	11.9	17.8	0.87	0.96	-0.09
Lebanon	0.744	70	25.09	1546	25.5	22.2	1396	23.1	19.9	0.89	0.91	-0.02
Lithuania	0.835	36	20.22	1530	54.6	26.0	1269	45.3	21.1	0.83	0.83	0.00
Luxembourg	0.892	20	18.85	278	48.1	27.0	203	35.1	19.1	0.84	0.73	0.11
Madagascar	0.507	141	0.13	148	0.6	1.0	133	0.5	0.9	0.89	0.91	-0.02
Malawi	0.452	158	0.31	127	0.7	1.5	121	0.6	1.4	0.80	0.95	-0.15
Malaysia	0.782	56	6.43	4547	14.2	14.7	3903	12.2	12.6	0.94	0.86	0.08
Maldives	0.688	95	5.80	38	8.6	11.9	32	7.2	10.3	1.00	0.84	0.16
Mali	0.408	168	0.20	246	1.3	3.0	239	1.3	3.0	0.91	1.00	-0.09
Malta	0.854	29	9.32	184	43.3	18.3	170	40.0	16.4	0.77	0.92	-0.15
Mauritania	0.503	143	1.54	60	1.3	2.4	60	1.3	2.4	1.00	1.00	0.00
Mauritius	0.768	63	6.43	196	15.6	9.9	172	13.7	8.6	1.37	0.88	0.49
Mexico	0.752	68	3.65	6952	5.4	5.4	5921	4.6	4.6	0.90	0.85	0.05
Moldova	0.693	94	5.45	1678	41.9	27.3	1302	32.5	21.0	0.83	0.78	0.05
Mongolia	0.719	87	8.10	429	13.8	18.6	368	11.8	16.1	0.93	0.86	0.07
Montenegro	0.798	49	16.09	407	65.6	39.2	333	53.6	30.6	0.95	0.82	0.13
Morocco	0.636	111	1.21	6391	17.7	17.0	6303	17.5	16.8	0.90	0.99	-0.09
Myanmar	0.541	134	0.08	7524	14.0	14.8	7347	13.7	14.5	0.89	0.98	-0.09
Namibia	0.612	116	4.78	62	2.4	4.2	61	2.4	4.1	0.95	1.00	-0.05

Netherlands	0.921	6	12.23	11713	70.1	32.4	9652	57.8	24.9	0.89	0.82	0.07
Nicaragua	0.625	114	0.49	289	4.6	5.5	269	4.3	5.1	0.90	0.93	-0.03
Niger	0.338	173	0.17	40	0.2	0.4	40	0.2	0.4	1.00	1.00	0.00
Oman	0.804	45	6.88	109	2.3	4.5	106	2.2	4.4	0.92	0.96	-0.04
Pakistan	0.533	136	0.33	9574	4.8	6.9	9069	4.5	6.6	0.87	0.94	-0.07
Panama	0.770	62	9.58	378	9.2	8.2	333	8.1	7.2	0.90	0.88	0.02
Papua New Guinea	0.508	140	0.41	603	7.2	11.6	597	7.1	11.5	0.88	0.99	-0.11
Paraguay	0.697	92	1.03	700	10.2	11.2	667	9.7	10.7	0.89	0.95	-0.06
Philippines	0.684	98	1.09	16597	15.6	19.9	14803	13.9	17.9	0.86	0.89	-0.03
Poland	0.836	35	10.60	26968	72.3	35.7	24910	66.7	32.3	0.89	0.92	-0.03
Portugal	0.829	38	27.43	4766	47.8	21.9	4144	41.5	18.2	0.82	0.87	-0.05
Qatar	0.850	31	8.30	71	2.6	7.8	66	2.4	7.5	0.90	0.92	-0.02
Romania	0.796	52	5.44	10862	56.6	29.3	9804	51.1	25.9	0.87	0.90	-0.03
Samoa	0.696	93	5.25	56	28.5	34.2	27	13.7	16.3	1.00	0.48	0.52
Saudi Arabia	0.837	34	3.82	898	2.7	4.1	754	2.3	3.6	0.90	0.85	0.05
Senegal	0.489	148	0.35	182	1.1	2.2	170	1.0	2.1	0.89	0.91	-0.02
Serbia	0.772	60	13.67	7851	91.1	49.8	6619	76.8	39.4	0.89	0.84	0.05
Sierra Leone	0.413	167	0.33	84	1.1	2.3	80	1.0	2.2	1.00	0.91	0.09
Slovenia	0.876	23	13.51	1390	68.5	32.1	1176	58.0	26.1	0.83	0.85	-0.02
South Africa	0.673	102	0.97	7867	13.7	16.4	7398	12.9	15.5	0.90	0.94	-0.04
South Korea	0.890	21	35.38	26285	52.1	26.0	17579	34.8	16.2	0.78	0.67	0.11
Spain	0.873	25	13.85	24812	55.3	26.3	19998	44.6	20.4	0.79	0.81	-0.02
Sri Lanka	0.762	67	1.69	1386	6.7	5.0	1143	5.5	4.1	0.89	0.82	0.07
Sudan	0.485	150	1.13	541	1.3	2.2	508	1.2	2.1	0.90	0.92	-0.02
Suriname	0.720	86	7.42	95	16.8	15.4	91	16.1	14.8	0.91	0.96	-0.05
Tajikistan	0.639	110	1.10	322	3.5	5.4	304	3.3	5.1	0.91	0.94	-0.03
Tanzania	0.501	145	0.12	149	0.3	0.5	148	0.3	0.5	1.00	1.00	0.00
Thailand	0.733	81	5.95	21492	31.4	18.9	19816	29.0	17.8	0.91	0.92	-0.01
Togo	0.484	151	0.73	75	0.9	1.9	74	0.9	1.8	0.88	0.99	-0.11
Trinidad and Tobago	0.784	55	2.98	239	17.5	12.4	197	14.5	10.2	0.90	0.83	0.07
Tunisia	0.721	85	8.91	1851	16.0	13.6	1760	15.2	13.0	0.90	0.95	-0.05
Turkey	0.765	65	14.52	33235	40.8	35.6	32377	39.8	34.8	0.89	0.98	-0.09
Uganda	0.497	147	0.45	464	1.0	2.7	439	1.0	2.7	0.91	0.99	-0.08
Uruguay	0.788	53	12.91	1452	42.9	27.2	1315	38.8	24.2	0.95	0.90	0.05
Vanuatu	0.584	122	0.00	14	5.0	8.0	15	5.3	8.7	0.92	1.06	-0.14
Yemen	0.501	146	3.61	544	1.9	3.9	542	1.9	3.9	0.88	1.00	-0.12
Zambia	0.552	128	0.21	233	1.3	3.4	228	1.3	3.4	1.00	1.00	0.00
Zimbabwe	0.516	139	0.42	310	1.8	4.0	298	1.8	4.0	0.90	1.00	-0.10

Figure 1

The human development index of (A) all selected countries ($n = 115$), and of countries with (B) HDI score < 0.70 ($n = 56$), and (C) HDI score ≥ 0.70 ($n = 59$), are significantly associated with CT density.

Figure 2

Lack of an association between CT density and MIR in 2012 (A). However, the CT density is significantly associated with (B) MIR in 2018 and (C) δ MIR in lung cancer.