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Original Article

Global Burden of Tracheal, Bronchus, and Lung Cancer in Adults Over 55 Years Old Based on Socio-demographic Status and Geographical and Gender Differences from 2010-2021

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Abstract

OBJECTIVE: This study presented the tracheal, bronchus, and lung cancer (TBLC) trend in adults ≥55 based on the socio-demographic index and geographical regions.

MATERIAL AND METHODS: We obtained annual TBLC data from 2010 to 2021 from the 2021 Global Burden of Disease (GBD) Study and analyzed the incidence, death rates, and disability-adjusted life years (DALYs) rates across different geographical classifications of 204 national and territorial.

RESULTS: In adults ≥55 years, the TBLC incidence rate decreased from 2010 to 2021 by globally 20.9% and 9.6% in males, while increasing by 3.8% in females. Approximately 60% of TBLC cases occurred in Asian countries. European countries exhibit the highest incidence rate (169.16 per 100,000). Males across all continents showed a decreasing trend, only the Americas reported a decreasing trend for women, with a noted change of 17.3%. The Western Pacific Region (World Health Organization region), East Asia (GBD region), Monaco, and countries with advanced health systems reported the highest incidence, death, and DALY numbers and rates for all genders. World Bank Upper middle-income countries recorded the highest DALY numbers and rates, incidence, and death numbers, all showing a downward trend, similar to high-income countries.

CONCLUSION: The global burden of TBLC is predominantly in Asian countries (mainly East Asia), with a slower decrease in incidence, death, DALY, and burden rates. Therefore, reducing exposure to risk factors, expanding screening and diagnostic programs, especially for high-risk male smokers and females, and improving treatment procedures to reduce the progression of this cancer are urgent.

KEYWORDS: 'Tracheal, bronchus, and lung cancer', socio-demographic index, incidence, death, burden

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INTRODUCTION

Tracheal, bronchus, and lung cancer (TBLC) presents a significant global health burden.[1] In 2019, 2.26 million new cases and 2.04 million deaths were attributed to TBLC, resulting in 45.9 million disability-adjusted life years (DALYs).[2] In addition, TBLC-related symptoms and treatment side effects can substantially diminish patients' quality of life and functional status. Smoking is the main cause of TBLC, but environmental exposures like air pollution and occupational carcinogens are also significant.[3] However, the relative contribution of each risk factor to mortality varies by sex, geography, and individual exposures.[4] Despite advancements in cancer treatment and technology, socioeconomic and geographic disparities affect access to appropriate care for TBLC patients.[5] Given the multifaceted nature of factors influencing TBLC burden, it is imperative to investigate their impact comprehensively. On the other hand, understanding the complex interplay of risk factors and their varying impact across demographics and regions is essential for developing targeted interventions to decrease the burden of TBLC worldwide.[6]

Due to physiological changes in lung aging, the incidence of TBLC increases with age,[7,8] and TBLC is considered one of the most important health challenges in old age.[9] Meanwhile, the symptoms of TBLC in old age are misleading and make screening and diagnosis challenging; a significant percentage of elderly people with TBLC do not show a desire to receive treatment services.[9-11] Given that the world population has shifted toward older ages,[12] it is of particular importance to examine statistics related to TBLC as an old age disease. Because proper policymaking and optimal implementation of cancer management programs require up-to-date and complete data, this study aims to investigate the burden of TBLC in adults aged ≥55 years, based on gender disparities among socio-demographic index (SDI) classifications and different geographical divisions. This is done by using the most up-to-date data from the Global Burden of Disease (GBD) study 2021 and its trend from 2010 to 2021.

MATERIAL AND METHODS

This study extracted data from the GBD 2021 online platform on the incidence, deaths, and DALYs of TBLC ≥55 from 2010 to 2021, which covers 369 diseases across 204 countries. The data were classified under the International Classification of Diseases-10 code (C33, C34.0–C34.92, Z12.2, Z80.1–Z80.2, and Z85.1–Z85.20).[13] Data were analyzed using classifications based on global trends, SDI, continents, World Bank regions, World Health Organization (WHO) regions, GBD regions, and national and territorial divisions by gender and age groups. Old age in the GBD begins at age 55 and extends to the age group of ≥70. Therefore, we decided to present data for individuals aged 55 and older. SDI is a measure that identifies where countries sit on the development spectrum and is expressed on a 0 to 100 scale; 0 being the lowest SDI value and 100 being the highest. SDI is based on three measures: lag-distributed income per capita, average years of schooling in ages 15 and older, and total fertility rate for females under age 25. Countries and territories are stratified into five groups based on SDI values: low SDI (<0.45), low-middle SDI (≥0.45 and <0.61), middle SDI (≥0.61 and <0.69), high-middle SDI (≥0.69 and <0.80), and high SDI (≥0.80).[14] The World Bank classifies economies into four income groups (low, medium-low, medium-high, and high) based on per capita gross national income, using the Atlas method to account for exchange rate fluctuations.[15] The study employs DALYs to measure the burden of TBLC, combining years of life lost due to premature death and years lived with disability.[16] To calculate total DALYs, years of life lost and years lived with disability were estimated and combined. GBD 2021 defined a summary measure of personal health care access and quality for a given location as the Healthcare Access and Quality (HAQ) Index. HAQ Index is based on risk-standardized mortality rates from causes that, in the presence of high-quality health care, should not result in death–also known as amenable mortality. Based on HAQ, countries and territories are classified into four groups: Advanced Health System, Basic Health System, Limited Health System, and Minimal Health System.[17]

Main Points

- In 2021, more than 66% of new tracheal, bronchus, and lung cancer (TBLC) cases were in men globally.
- In adults' ≥55 years, the TBLC incidence rate decreased from 2010 to 2021 globally by 20.9%.
- The TBLC incidence rate decreased by 9.6% in males and increased by 3.8% in females.
- Approximately 60% of TBLC cases occurred in Asian countries.
- European countries exhibiting the highest incidence rate.

Ethical Consideration

The Jahrom University of Medical Sciences Ethical Research Committee approved this study (approval no: IR.JUMS.REC.1401.094, date: 23.11.2022). Because utilizing anonymous online datasets, informed consent was not required.

Statistical Analysis

The incidence, mortality, and DALY rates were calculated per 100,000 population with a 95% confidence interval. Selected epidemiological metrics are delineated individually for each classification. Definitions of the terms utilized are available at: https://www.healthdata.org/terms-defined and https://www.healthdata.org/gbd/

RESULTS

The Global Trend of TBLC Among Aged ≥55 Years

In 2021, 2,021.521 new cases of TBLC were recorded globally, 66% in males and 34% in females. TBLC incidence rate (per 100,000) with a 5.1% decrease compared to 2010 reached 190.704 in 2021. Also, 1,808.810 deaths related to TBLC were recorded globally, 66.6% in males and 33.4% in females. TBLC death rate (per 100,000) with a 7.1% decrease compared to 2010 reached 121.725 in 2021. The DALYs numbers related to TBLC were recorded as 37,632.985, globally, 67.8% in males and 32.2% in females. TBLC DALY rate (per 100,000) with a 9.2% decrease compared to 2010 reached 2,532.526 in 2021. Between 2010 and 2021, the TBLC incidence, death, and DALY rates decreased by 9.6, 11.2, and 13.3% in males, respectively. In contrast, females recorded a 3.8, 2.3, and 0.7% increase in incidence, death, and DALY rates, respectively (Tables 1, 2, 3 and, Figure 1).

Table 1. Incidence of TBLC in ≥55 years old in 2021 and its changes from 2010 to 2021

Location	Both genders			Males			Females		
	Incidence number	Incidence rate per 100,000	Changes (2010-2021)	Incidence number	Incidence rate per 100,000	Changes (2010-2021)	Incidence number	Incidence rate per 100,000	Changes (2010-2021)
Global	2021521	136.039	-0.051	1334012	190.704	-0.091	687509	87.417	0.038
	(1826641_2220212)	(122.925_149.41)	(-0.135_0.034)	(1173641_1502454)	(167.779_214.784)	(-0.198_0.029)	(602528_761779)	(76.612_96.861)	(-0.051_0.142)
SDI									
High SDI	695752	201.660	-0.109	419104	260.958	-0.161	276647	150.017	-0.032
	(632877_730778)	(183.436_211.812)	(-0.137_-0.086)	(389630_438888)	(242.605_273.276)	(-0.19_-0.132)	(242064_295776)	(131.264_160.39)	(-0.062_-0.006)
High-middle SDI	646561	186.502	-0.001	447354	281.754	-0.073	199207	106.016	0.182
	(565073_738061)	(162.997_212.896)	(-0.122_0.14)	(372730_528061)	(234.754_332.585)	(-0.228_0.105)	(166192_236098)	(88.446_125.649)	(-0.008_0.406)
Low SDI	20925	25.501	0.047	15046	37.409	0.015	5880	14.053	0.170
	(17842_24404)	(21.743_29.74)	(-0.081_0.188)	(12703_17955)	(31.584_44.644)	(-0.113_0.172)	(4830_6851)	(11.543_16.374)	(-0.002_0.383)
Low-middle SDI	103032	42.737	0.043	72323	62.569	0.022	30710	24.471	0.130
	(93995_113138)	(38.988_46.929)	(-0.07_0.144)	(66413_79644)	(57.457_68.904)	(-0.109_0.144)	(26657_34612)	(21.241_27.581)	(0.013_0.254)
Middle SDI	553323	117.764	0.041	378875	169.338	0.005	174448	70.879	0.153
	(461703_641449)	(98.264_136.52)	(-0.124_0.215)	(301061_459098)	(134.559_205.194)	(-0.199_0.235)	(146345_205815)	(59.461_83.624)	(-0.034_0.378)
World Bank income level									
World Bank high-income	756867	193.124	-0.107	467439	258.101	-0.164	289427	137.299	-0.016
	(687279_791117)	(175.367_201.863)	(-0.129_-0.091)	(436661_485057)	(241.106_267.828)	(-0.186_-0.145)	(251864_309385)	(119.48_146.767)	(-0.042_0.007)
World Bank low income	20065	41.829	-0.066	14134	61.810	-0.075	5931	23.628	-0.039
	(15622_25292)	(32.567_52.727)	(-0.171_0.064)	(10925_18343)	(47.776_80.217)	(-0.178_0.075)	(4278_7622)	(17.043_30.366)	(-0.206_0.133)
World Bank lower middle-income	204928	46.489	0.031	147975	69.961	0.000	56952	24.837	0.148
	(178963_227155)	(40.598_51.531)	(-0.098_0.135)	(129646_164293)	(61.295_77.676)	(-0.135_0.111)	(47588_65604)	(20.754_28.61)	(0.02_0.288)
World Bank upper middle-income	1037726	171.810	0.030	703147	248.081	-0.020	334579	104.373	0.165
	(870368_1217969)	(144.101_201.652)	(-0.135_0.206)	(557692_861192)	(196.762_303.841)	(-0.222_0.223)	(275202_398729)	(85.85_124.385)	(-0.046_0.419)
Continents									
Africa	41556	38.582	-0.011	31111	60.396	-0.010	10445	18.586	0.050
	(36441_47343)	(33.833_43.955)	(-0.114_0.122)	(27337_35519)	(53.07_68.953)	(-0.121_0.141)	(8826_11903)	(15.705_21.181)	(-0.099_0.205)
America	320264	138.088	-0.209	174764	163.517	-0.237	145500	116.355	-0.173
	(293708_335006)	(126.638_144.445)	(-0.229_-0.191)	(164613_181694)	(154.02_170.001)	(-0.26_-0.217)	(128872_153723)	(103.057_122.93)	(-0.198_-0.15)

Table 1. Continued

Location	Both genders			Males			Females		
	Incidence number	Incidence rate per 100,000	Changes (2010-2021)	Incidence number	Incidence rate per 100,000	Changes (2010-2021)	Incidence number	Incidence rate per 100,000	Changes (2010-2021)
Asia	1207198	137.507	0.036	818012	193.518	-0.002	389185	85.496	0.141
	(1027784_1393003)	(117.071_158.672)	(-0.117_0.189)	(657720_980997)	(155.597_232.075)	(-0.191_0.213)	(325424_454644)	(71.489_99.876)	(-0.045_0.349)
Europe	449726	169.159	-0.077	308258	262.897	-0.156	141467	95.197	0.101
	(420474_469822)	(158.156_176.718)	(-0.109_-0.048)	(290221_322467)	(247.514_275.014)	(-0.191_-0.124)	(127226_150238)	(85.614_101.099)	(0.062_0.139)
WHO Regions									
African Region	26886	32.276	-0.039	18867	48.501	-0.046	8019	18.061	0.034
	(23986_30233)	(28.794_36.294)	(-0.128_0.068)	(16910_21457)	(43.471_55.16)	(-0.143_0.072)	(6783_9123)	(15.277_20.546)	(-0.1_0.175)
Eastern Mediterranean Region	41935	56.333	-0.037	33332	86.299	-0.059	8603	24.018	0.070
	(36862_48146)	(49.519_64.677)	(-0.155_0.105)	(29062_38683)	(75.243_100.151)	(-0.185_0.101)	(7079_10248)	(19.765_28.612)	(-0.112_0.259)
European Region	456888	164.202	-0.086	313519	255.369	-0.163	143369	92.213	0.090
	(426699_477162)	(153.352_171.488)	(-0.117_-0.057)	(295418_327900)	(240.625_267.082)	(-0.197_-0.133)	(128947_152150)	(82.937_97.861)	(0.051_0.126)
Region of the Americas	320264	138.088	-0.209	174764	163.517	-0.237	145500	116.355	-0.173
	(293708_335006)	(126.638_144.445)	(-0.229_-0.191)	(164613_181694)	(154.02_170.001)	(-0.26_-0.217)	(128872_153723)	(103.057_122.93)	(-0.198_-0.15)
South-East Asia Region	141386	45.774	0.070	97459	65.526	0.045	43927	27.430	0.144
	(120733_158579)	(39.088_51.34)	(-0.083_0.203)	(84186_110334)	(56.602_74.183)	(-0.13_0.198)	(35304_51396)	(22.045_32.093)	(-0.007_0.296)
Western Pacific Region	1020528	204.484	0.051	687437	287.748	0.011	333090	128.027	0.160
	(852097_1200801)	(170.736_240.606)	(-0.12_0.233)	(538078_846822)	(225.229_354.464)	(-0.205_0.266)	(270000_400439)	(103.778_153.914)	(-0.051_0.407)
Health System Grouping Level									
Advanced Health System	865692	183.297	-0.103	554171	259.245	-0.161	311521	120.500	-0.005
	(793798_901757)	(168.075_190.934)	(-0.124_-0.085)	(522373_575080)	(244.369_269.026)	(-0.184_-0.139)	(272657_332329)	(105.467_128.548)	(-0.033_0.017)
Basic Health System	1037237	156.528	0.033	695751	219.963	-0.005	341486	98.595	0.139
	(863044_1209508)	(130.24_182.525)	(-0.134_0.206)	(545234_853562)	(172.377_269.856)	(-0.212_0.247)	(283663_405417)	(81.9_117.054)	(-0.068_0.383)
Limited Health System	110509	33.509	0.058	78322	49.135	0.025	32187	18.890	0.194
	(99227_123189)	(30.088_37.353)	(-0.095_0.19)	(69613_87243)	(43.672_54.731)	(-0.141_0.176)	(28051_37003)	(16.462_21.716)	(0.036_0.367)
Minimal Health System	6155	30.847	0.032	4458	47.156	-0.001	1697	16.162	0.110
	(4732_8415)	(23.717_42.175)	(-0.111_0.203)	(3312_6511)	(35.03_68.869)	(-0.145_0.178)	(1310_2127)	(12.474_20.261)	(-0.101_0.38)

Table 1. Continued

Location	Both genders			Males			Females		
	Incidence number	Incidence rate per 100,000	Changes (2010-2021)	Incidence number	Incidence rate per 100,000	Changes (2010-2021)	Incidence number	Incidence rate per 100,000	Changes (2010-2021)
GBD Region									
Central Europe, Eastern Europe, and Central Asia	158210	139.200	-0.083	116847	251.347	-0.158	41363	61.580	0.130
	(149274_166827)	(131.337_146.782)	(-0.131_-0.036)	(109046_123778)	(234.566_266.255)	(-0.215_-0.109)	(38125_44195)	(56.761_65.797)	(0.062_0.2)
Central Asia	8883	61.052	-0.245	7035	110.138	-0.279	1848	22.645	-0.153
	(7934_9825)	(54.529_67.526)	(-0.321_-0.161)	(6237_7829)	(97.65_122.57)	(-0.355_-0.201)	(1640_2066)	(20.087_25.31)	(-0.252_-0.044)
Central Europe	74924	202.344	0.011	51121	315.904	-0.081	23803	114.187	0.253
	(69374_79915)	(187.354_215.824)	(-0.057_0.077)	(46938_54757)	(290.056_338.375)	(-0.149_-0.015)	(21711_25785)	(104.15_123.693)	(0.155_0.347)
Eastern Europe	74403	119.852	-0.107	58692	245.376	-0.170	15711	41.172	0.075
	(67454_80970)	(108.659_130.43)	(-0.186_-0.029)	(52241_64937)	(218.408_271.484)	(-0.26_-0.084)	(14108_17298)	(36.97_45.33)	(-0.023_0.181)
High-income	691861	194.495	-0.112	424106	258.003	-0.164	267755	139.935	-0.029
	(626369_724173)	(176.084_203.578)	(-0.134_-0.094)	(392777_440963)	(238.944_268.258)	(-0.187_-0.144)	(232204_286604)	(121.355_149.786)	(-0.056_-0.006)
Australasia	15257	172.707	-0.063	8652	205.931	-0.108	6606	142.578	0.002
	(13607_16731)	(154.02_189.387)	(-0.139_0.022)	(7746_9578)	(184.379_227.976)	(-0.204_-0.005)	(5708_7247)	(123.205_156.415)	(-0.069_0.085)
High-income Asia Pacific	148952	211.270	0.029	104651	323.420	-0.011	44301	116.137	0.111
	(128808_160986)	(182.697_228.337)	(-0.03_0.087)	(94133_111703)	(290.915_345.215)	(-0.07_0.045)	(34126_50605)	(89.464_132.662)	(0.024_0.186)
High-income North America	238470	211.909	-0.214	125182	239.398	-0.247	113288	188.049	-0.178
	(218679_250417)	(194.322_222.525)	(-0.234_-0.195)	(117851_130919)	(225.377_250.369)	(-0.271_-0.223)	(99655_120365)	(165.42_199.796)	(-0.203_-0.153)
Southern Latin America	15313	104.055	-0.158	9959	151.383	-0.230	5354	65.792	0.005
	(14002_16597)	(95.147_112.78)	(-0.223_-0.08)	(9099_10796)	(138.306_164.11)	(-0.298_-0.158)	(4754_5917)	(58.418_72.717)	(-0.084_0.122)
Western Europe	273869	183.639	-0.089	175662	254.760	-0.173	98207	122.479	0.080
	(251000_289406)	(168.305_194.057)	(-0.124_-0.057)	(162467_184723)	(235.624_267.902)	(-0.21_-0.137)	(86593_105674)	(107.995_131.792)	(0.036_0.119)
Latin America and Caribbean	67647	63.680	-0.076	40387	82.915	-0.129	27260	47.391	0.026
	(61809_72854)	(58.185_68.582)	(-0.13_-0.023)	(37458_43429)	(76.902_89.16)	(-0.185_-0.069)	(24411_29522)	(42.439_51.324)	(-0.04_0.093)
Andean Latin America	5057	51.046	-0.032	2781	58.751	-0.059	2276	43.995	0.009
	(3955_6224)	(39.919_62.826)	(-0.223_0.182)	(2188_3439)	(46.22_72.659)	(-0.25_0.155)	(1706_2836)	(32.99_54.817)	(-0.203_0.25)
Caribbean	10041	108.453	-0.054	6712	154.337	-0.069	3329	67.810	-0.006
	(8895_11264)	(96.069_121.661)	(-0.166_0.056)	(5885_7636)	(135.322_175.597)	(-0.19_0.045)	(2855_3798)	(58.154_77.358)	(-0.125_0.119)
Central Latin America	20093	46.983	-0.126	11994	61.013	-0.158	8099	35.048	-0.061
	(17757_22694)	(41.522_53.065)	(-0.217_-0.022)	(10444_13663)	(53.131_69.507)	(-0.258_-0.049)	(6975_9309)	(30.183_40.282)	(-0.173_0.056)

Table 1. Continued

Location	Both genders			Males			Females		
	Incidence number	Incidence rate per 100,000	Changes (2010-2021)	Incidence number	Incidence rate per 100,000	Changes (2010-2021)	Incidence number	Incidence rate per 100,000	Changes (2010-2021)
Tropical Latin America	32456	73.267	-0.040	18900	94.649	-0.124	13555	55.717	0.115
	(30008_34298)	(67.741_77.426)	(-0.08_0.001)	(17679_19936)	(88.534_99.837)	(-0.167_-0.074)	(12277_14483)	(50.464_59.531)	(0.059_0.17)
North Africa and Middle East	57987	76.064	-0.052	46835	121.381	-0.079	11152	29.621	0.072
	(50384_67122)	(66.091_88.047)	(-0.179_0.104)	(40247_55213)	(104.308_143.095)	(-0.213_0.084)	(9313_13049)	(24.736_34.659)	(-0.116_0.268)
North Africa and Middle East	57987	76.064	-0.052	46835	121.381	-0.079	11152	29.621	0.072
	(50384_67122)	(66.091_88.047)	(-0.179_0.104)	(40247_55213)	(104.308_143.095)	(-0.213_0.084)	(9313_13049)	(24.736_34.659)	(-0.116_0.268)
South Asia	75444	30.385	0.120	54583	44.856	0.060	20861	16.476	0.357
	(63426_85929)	(25.545_34.608)	(-0.076_0.307)	(44305_62935)	(36.41_51.72)	(-0.155_0.269)	(17666_24390)	(13.953_19.264)	(0.113_0.63)
South Asia	75444	30.385	0.120	54583	44.856	0.060	20861	16.476	0.357
	(63426_85929)	(25.545_34.608)	(-0.076_0.307)	(44305_62935)	(36.41_51.72)	(-0.155_0.269)	(17666_24390)	(13.953_19.264)	(0.113_0.63)
Southeast Asia, East Asia, and Oceania	945194	186.095	0.046	633796	260.209	0.010	311398	117.803	0.146
	(776899_1113883)	(152.96_219.307)	(-0.142_0.242)	(485921_790433)	(199.498_324.518)	(-0.222_0.293)	(253934_374308)	(96.064_141.602)	(-0.083_0.418)
East Asia	836971	213.447	0.060	559211	294.799	0.023	277760	137.214	0.169
	(676469_1012020)	(172.515_258.089)	(-0.147_0.286)	(415219_715425)	(218.891_377.151)	(-0.241_0.344)	(219672_341439)	(108.518_168.671)	(-0.088_0.477)
Oceania	936	75.821	0.035	675	104.490	0.023	260	44.298	0.082
	(712_1289)	(57.697_104.419)	(-0.149_0.254)	(500_958)	(77.331_148.228)	(-0.164_0.259)	(191_363)	(32.468_61.819)	(-0.12_0.31)
Southeast Asia	107288	93.657	-0.010	73910	138.841	-0.026	33378	54.431	0.021
	(88294_123475)	(77.076_107.787)	(-0.147_0.118)	(61861_86517)	(116.206_162.524)	(-0.178_0.127)	(25868_39814)	(42.185_64.927)	(-0.127_0.174)
Sub-Saharan Africa	25179	32.306	-0.035	17458	48.360	-0.040	7721	18.454	0.037
	(22424_28362)	(28.771_36.39)	(-0.124_0.076)	(15514_19997)	(42.974_55.394)	(-0.139_0.08)	(6510_8808)	(15.56_21.053)	(-0.098_0.184)
Central Sub-Saharan Africa	3657	40.525	0.090	2672	64.810	0.046	985	20.100	0.154
	(2612_5501)	(28.944_60.966)	(-0.137_0.369)	(1780_4271)	(43.176_103.613)	(-0.19_0.325)	(718_1312)	(14.654_26.764)	(-0.148_0.529)
Eastern Sub-Saharan Africa	7448	27.545	0.013	5166	40.112	-0.026	2281	16.114	0.143
	(6459_8794)	(23.887_32.526)	(-0.142_0.169)	(4375_6190)	(33.968_48.064)	(-0.202_0.152)	(1796_2752)	(12.685_19.439)	(-0.061_0.381)
Southern Sub-Saharan Africa	8232	84.559	-0.104	5320	131.656	-0.148	2912	51.137	-0.009
	(7487_9135)	(76.905_93.832)	(-0.186_-0.009)	(4708_6004)	(116.508_148.582)	(-0.243_-0.035)	(2545_3304)	(44.686_58.02)	(-0.132_0.119)
Western Sub-Saharan Africa	5843	18.177	-0.004	4300	28.557	0.026	1542	9.028	0.088
	(4876_6946)	(15.17_21.608)	(-0.127_0.154)	(3615_5113)	(24.008_33.959)	(-0.12_0.21)	(1204_1833)	(7.047_10.731)	(-0.092_0.303)

SDI: socio-demographic index, TBLC: tracheal, bronchus, and lung cancer, WHO: World Health Organization

Table 2. Death of TBLC in ≥55 years old in 2021 and its changes from 2010 to 2021

	Both genders			Males			Females		% Changes (2010-2021)
	Death number	Death rate per 100,000	Changes (2010-2021)	Death number	Death rate per 100,000	Changes (2010-2021)	Death number	Death rate per 100,000	
Global	1808810	121.725	-0.071	1203940	172.110	-0.112	604871	76.910	0.023
	(1632909_1986037)	(109.887_133.651)	(-0.153_0.013)	(1060249_1353298)	(151.568_193.462)	(-0.215_0.003)	(529955_670701)	(67.384_85.28)	(-0.068_0.124)
SDI									
High SDI	566616	164.230	-0.112	345357	215.039	-0.165	221259	119.982	-0.030
	(514794_597233)	(149.21_173.104)	(-0.14_-0.089)	(321174_361385)	(199.981_225.018)	(-0.193_-0.137)	(192124_237407)	(104.182_128.738)	(-0.062_-0.004)
High-middle SDI	582299	167.966	-0.048	403726	254.276	-0.116	178573	95.035	0.124
	(511627_660153)	(147.58_190.423)	(-0.163_0.081)	(337465_472938)	(212.543_297.867)	(-0.26_0.049)	(149964_210287)	(79.809_111.913)	(-0.047_0.333)
Low SDI	22438	27.343	0.043	16134	40.115	0.012	6304	15.067	0.166
	(19157_26265)	(23.346_32.008)	(-0.085_0.184)	(13646_19298)	(33.93_47.981)	(-0.121_0.165)	(5177_7388)	(12.373_17.658)	(-0.006_0.384)
Low-middle SDI	109722	45.512	0.036	76881	66.513	0.015	32841	26.169	0.122
	(99966_120661)	(41.465_50.05)	(-0.077_0.138)	(70636_84716)	(61.11_73.292)	(-0.116_0.135)	(28508_37098)	(22.717_29.561)	(0.006_0.245)
Middle SDI	525850	111.917	-0.015	360568	161.156	-0.048	165282	67.155	0.085
	(440585_608749)	(93.77_129.56)	(-0.163_0.141)	(287772_433959)	(128.62_193.958)	(-0.236_0.162)	(139632_193715)	(56.733_78.707)	(-0.081_0.297)
World Bank income level									
World Bank high-income	626018	162.533	-0.111	392179	220.118	-0.169	233838	112.968	-0.014
	(568180_655898)	(147.517_170.291)	(-0.133_-0.095)	(365014_406461)	(204.871_228.134)	(-0.189_-0.151)	(201889_250862)	(97.533_121.192)	(-0.041_0.007)
World Bank low income	21409	40.639	-0.067	15049	60.407	-0.075	6360	22.903	-0.043
	(16684_27216)	(31.67_51.663)	(-0.172_0.062)	(11657_19562)	(46.791_78.52)	(-0.176_0.075)	(4538_8223)	(16.342_29.615)	(-0.211_0.132)
World Bank lower middle-income	214183	50.487	0.027	154337	75.737	-0.003	59846	27.147	0.139
	(187232_237375)	(44.135_55.954)	(-0.102_0.129)	(134984_171526)	(66.24_84.172)	(-0.141_0.108)	(49854_69003)	(22.615_31.301)	(0.013_0.28)
World Bank upper middle-income	945308	151.829	-0.028	641094	219.509	-0.075	304214	92.032	0.097
	(798105_1106833)	(128.187_177.772)	(-0.18_0.131)	(509699_781793)	(174.52_267.684)	(-0.264_0.146)	(253302_360235)	(76.63_108.979)	(-0.095_0.326)
Continents									
Africa	44412	41.233	-0.017	33260	64.567	-0.016	11152	19.845	0.040
	(38953_50628)	(36.165_47.004)	(-0.118_0.116)	(29195_38124)	(56.676_74.01)	(-0.124_0.137)	(9422_12750)	(16.766_22.688)	(-0.108_0.195)
America	273626	117.980	-0.200	152706	142.878	-0.231	120921	96.699	-0.159
	(250592_286741)	(108.048_123.634)	(-0.222_-0.181)	(143216_158884)	(133.999_148.659)	(-0.253_-0.21)	(107198_128030)	(85.724_102.384)	(-0.184_-0.135)
Asia	1084447	123.525	-0.007	736097	174.139	-0.043	348349	76.525	0.092
	(922965_1246915)	(105.131_142.031)	(-0.151_0.141)	(593111_882222)	(140.313_208.708)	(-0.225_0.167)	(291907_405627)	(64.126_89.108)	(-0.085_0.294)
Europe	403667	151.834	-0.087	280133	238.910	-0.162	123534	83.129	0.091
	(376617_421943)	(141.66_158.709)	(-0.118_-0.058)	(263696_292863)	(224.892_249.767)	(-0.198_-0.131)	(110439_131653)	(74.317_88.592)	(0.052_0.124)

Table 2. Continued

	Both genders			Males			Females		% Changes (2010-2021)
	Death number	Death rate per 100,000	Changes (2010-2021)	Death number	Death rate per 100,000	Changes (2010-2021)	Death number	Death rate per 100,000	
WHO Regions									
African Region	28698	34.451	-0.045	20120	51.722	-0.050	8578	19.319	0.024
	(25638_32262)	(30.777_38.729)	(-0.133_0.064)	(18069_22935)	(46.449_58.958)	(-0.146_0.068)	(7255_9804)	(16.34_22.08)	(-0.108_0.167)
Eastern Mediterranean Region	45076	60.553	-0.044	35838	92.786	-0.066	9238	25.792	0.062
	(39671_51738)	(53.292_69.502)	(-0.162_0.097)	(31310_41579)	(81.063_107.65)	(-0.189_0.092)	(7601_10984)	(21.223_30.667)	(-0.117_0.248)
European Region	410799	147.638	-0.095	285364	232.436	-0.170	125434	80.678	0.079
	(383052_429581)	(137.666_154.388)	(-0.127_-0.067)	(269234_298225)	(219.297_242.911)	(-0.204_-0.14)	(112256_133582)	(72.202_85.918)	(0.04_0.112)
Region of the Americas	273626	117.980	-0.200	152706	142.878	-0.231	120921	96.699	-0.159
	(250592_286741)	(108.048_123.634)	(-0.222_-0.181)	(143216_158884)	(133.999_148.659)	(-0.253_-0.21)	(107198_128030)	(85.724_102.384)	(-0.184_-0.135)
South-East Asia Region	149227	48.313	0.060	102636	69.007	0.036	46591	29.093	0.132
	(127373_167292)	(41.238_54.161)	(-0.089_0.191)	(88586_116132)	(59.561_78.081)	(-0.138_0.186)	(37479_54510)	(23.403_34.038)	(-0.017_0.281)
Western Pacific Region	888144	177.959	-0.001	598886	250.682	-0.039	289258	111.180	0.102
	(738679_1042408)	(148.01_208.869)	(-0.168_0.171)	(468194_737822)	(195.977_308.839)	(-0.248_0.211)	(235036_347349)	(90.339_133.508)	(-0.103_0.346)
Health System Grouping Level									
Advanced Health System	729231	154.404	-0.106	474485	221.967	-0.165	254745	98.538	-0.002
	(666188_761007)	(141.055_161.132)	(-0.128_-0.087)	(445938_493326)	(208.613_230.781)	(-0.188_-0.144)	(222127_272230)	(85.921_105.301)	(-0.031_0.02)
Basic Health System	953998	143.966	-0.027	640528	202.504	-0.063	313470	90.506	0.071
	(798590_1107650)	(120.514_167.153)	(-0.18_0.133)	(505842_781342)	(159.923_247.023)	(-0.253_0.163)	(263446_369619)	(76.063_106.718)	(-0.12_0.288)
Limited Health System	117102	35.508	0.050	82881	51.995	0.017	34222	20.084	0.182
	(105226_130499)	(31.907_39.57)	(-0.102_0.179)	(73724_92328)	(46.25_57.921)	(-0.147_0.167)	(29807_39274)	(17.493_23.049)	(0.026_0.348)
Minimal Health System	6593	33.043	0.026	4771	50.472	-0.008	1822	17.350	0.105
	(5058_9047)	(25.348_45.342)	(-0.119_0.202)	(3552_6952)	(37.578_73.536)	(-0.147_0.171)	(1397_2296)	(13.308_21.867)	(-0.104_0.382)
GBD Region									
Central Europe, Eastern Europe, and Central Asia	150860	132.733	-0.097	110971	238.706	-0.173	39889	59.387	0.120
	(142404_158787)	(125.293_139.707)	(-0.141_-0.052)	(103788_117408)	(223.256_252.552)	(-0.227_-0.127)	(36725_42578)	(54.675_63.391)	(0.056_0.184)

Table 2. Continued

	Both genders			Males			Females		% Changes (2010-2021)
	Death number	Death rate per 100,000	Changes (2010-2021)	Death number	Death rate per 100,000	Changes (2010-2021)	Death number	Death rate per 100,000	
Central Asia	9109	62.605	-0.261	7180	112.416	-0.294	1929	23.631	-0.176
	(8144_10065)	(55.974_69.179)	(-0.334_-0.181)	(6358_7953)	(99.55_124.514)	(-0.368_-0.219)	(1713_2154)	(20.983_26.392)	(-0.269_-0.071)
Central Europe	74575	201.401	0.013	50792	313.870	-0.082	23783	114.092	0.265
	(69151_79336)	(186.754_214.26)	(-0.052_0.076)	(46712_54314)	(288.661_335.637)	(-0.149_-0.017)	(21677_25710)	(103.99_123.336)	(0.172_0.352)
Eastern Europe	67176	108.211	-0.139	52999	221.577	-0.200	14177	37.151	0.031
	(61079_72932)	(98.389_117.482)	(-0.214_-0.065)	(47449_58260)	(198.373_243.571)	(-0.283_-0.119)	(12739_15580)	(33.382_40.829)	(-0.061_0.128)
High-income	561913	157.964	-0.114	349411	212.563	-0.167	212502	111.058	-0.030
	(508470_590518)	(142.94_166.005)	(-0.137_-0.097)	(324274_362986)	(197.271_220.821)	(-0.188_-0.149)	(182869_228329)	(95.571_119.33)	(-0.058_-0.008)
Australasia	11554	130.792	-0.092	6741	160.438	-0.127	4814	103.907	-0.042
	(10292_12717)	(116.497_143.946)	(-0.166_-0.008)	(6032_7455)	(143.577_177.446)	(-0.215_-0.027)	(4166_5305)	(89.911_114.514)	(-0.111_0.027)
High-income Asia Pacific	112940	160.191	0.045	79137	244.570	0.005	33803	88.615	0.127
	(96202_122466)	(136.45_173.702)	(-0.011_0.096)	(70914_84035)	(219.155_259.707)	(-0.041_0.05)	(25676_38993)	(67.309_102.221)	(0.046_0.194)
High-income North America	188320	167.345	-0.211	101358	193.837	-0.243	86962	144.350	-0.175
	(172395_198522)	(153.193_176.41)	(-0.232_-0.192)	(95110_105954)	(181.888_202.625)	(-0.27_-0.221)	(76277_92754)	(126.614_153.964)	(-0.2_-0.151)
Southern Latin America	15778	107.213	-0.172	10278	156.232	-0.239	5500	67.584	-0.020
	(14424_17161)	(98.016_116.617)	(-0.234_-0.095)	(9431_11146)	(143.364_169.42)	(-0.308_-0.167)	(4882_6104)	(59.989_75.012)	(-0.105_0.087)
Western Europe	233320	156.450	-0.099	151897	220.295	-0.179	81423	101.547	0.065
	(212064_246994)	(142.196_165.618)	(-0.133_-0.066)	(140457_159822)	(203.703_231.788)	(-0.214_-0.147)	(70954_87822)	(88.491_109.528)	(0.023_0.101)
Latin America and Caribbean	70597	66.458	-0.087	41724	85.661	-0.139	28873	50.196	0.011
	(64558_76143)	(60.773_71.678)	(-0.141_-0.034)	(38584_44880)	(79.213_92.14)	(-0.192_-0.082)	(25745_31373)	(44.757_54.542)	(-0.053_0.079)
Andean Latin America	5439	54.906	-0.055	2991	63.182	-0.081	2448	47.332	-0.014
	(4247_6628)	(42.874_66.907)	(-0.243_0.154)	(2334_3677)	(49.308_77.675)	(-0.269_0.135)	(1829_3058)	(35.366_59.117)	(-0.217_0.23)
Caribbean	9558	103.231	-0.070	6107	140.434	-0.092	3450	70.278	-0.017
	(8476_10756)	(91.545_116.176)	(-0.178_0.032)	(5382_6866)	(123.765_157.888)	(-0.205_0.012)	(2976_3926)	(60.622_79.976)	(-0.13_0.1)
Central Latin America	21342	49.904	-0.138	12696	64.588	-0.169	8646	37.412	-0.076
	(18903_24063)	(44.201_56.266)	(-0.229_-0.039)	(11076_14471)	(56.343_73.617)	(-0.268_-0.062)	(7411_9959)	(32.071_43.096)	(-0.188_0.039)
Tropical Latin America	34258	77.336	-0.049	19930	99.804	-0.130	14329	58.895	0.100
	(31582_36215)	(71.295_81.753)	(-0.089_-0.006)	(18588_21030)	(93.082_105.314)	(-0.173_-0.081)	(12907_15329)	(53.053_63.006)	(0.045_0.154)

Table 2. Continued

	Both genders			Males			Females		% Changes (2010-2021)
	Death number	Death rate per 100,000	Changes (2010-2021)	Death number	Death rate per 100,000	Changes (2010-2021)	Death number	Death rate per 100,000	
North Africa and Middle East	62269	81.682	-0.058	50281	130.314	-0.085	11988	31.841	0.063
	(54488_72079)	(71.475_94.55)	(-0.184_0.098)	(43336_59239)	(112.315_153.53)	(-0.217_0.079)	(10014_13939)	(26.598_37.025)	(-0.121_0.26)
North Africa and Middle East	62269	81.682	-0.058	50281	130.314	-0.085	11988	31.841	0.063
	(54488_72079)	(71.475_94.55)	(-0.184_0.098)	(43336_59239)	(112.315_153.53)	(-0.217_0.079)	(10014_13939)	(26.598_37.025)	(-0.121_0.26)
South Asia	79596	32.057	0.111	57538	47.285	0.052	22058	17.422	0.342
	(66946_90425)	(26.962_36.418)	(-0.084_0.294)	(46646_66292)	(38.334_54.479)	(-0.159_0.256)	(18694_25775)	(14.765_20.358)	(0.103_0.612)
South Asia	79596	32.057	0.111	57538	47.285	0.052	22058	17.422	0.342
	(66946_90425)	(26.962_36.418)	(-0.084_0.294)	(46646_66292)	(38.334_54.479)	(-0.159_0.256)	(18694_25775)	(14.765_20.358)	(0.103_0.612)
Southeast Asia, East Asia, and Oceania	856734	168.678	-0.019	575428	236.246	-0.052	281305	106.419	0.075
	(707838_1006822)	(139.363_198.229)	(-0.191_0.164)	(442793_715500)	(181.792_293.753)	(-0.265_0.207)	(231638_335834)	(87.629_127.047)	(-0.135_0.325)
East Asia	742883	189.452	-0.012	497183	262.100	-0.047	245700	121.376	0.090
	(600890_895412)	(153.241_228.351)	(-0.207_0.194)	(371156_635002)	(195.662_334.754)	(-0.293_0.246)	(195934_301544)	(96.791_148.963)	(-0.148_0.379)
Oceania	999	80.941	0.029	722	111.783	0.017	276	47.028	0.073
	(759_1382)	(61.46_111.976)	(-0.164_0.256)	(531_1029)	(82.141_159.28)	(-0.173_0.254)	(201_388)	(34.215_65.929)	(-0.137_0.31)
Southeast Asia	112852	98.514	-0.023	77523	145.629	-0.040	35329	57.613	0.007
	(92675_130034)	(80.9_113.513)	(-0.158_0.106)	(64911_90474)	(121.936_169.956)	(-0.188_0.109)	(27315_42107)	(44.543_68.666)	(-0.135_0.161)
Sub-Saharan Africa	26841	34.439	-0.040	18586	51.484	-0.045	8256	19.732	0.028
	(23894_30298)	(30.657_38.873)	(-0.13_0.07)	(16551_21344)	(45.847_59.123)	(-0.143_0.075)	(6970_9434)	(16.659_22.547)	(-0.107_0.178)
Central Sub-Saharan Africa	3863	42.808	0.081	2816	68.309	0.037	1047	21.359	0.145
	(2751_5728)	(30.482_63.482)	(-0.145_0.365)	(1864_4526)	(45.215_109.804)	(-0.198_0.318)	(759_1418)	(15.484_28.936)	(-0.161_0.535)
Eastern Sub-Saharan Africa	7993	29.563	0.011	5549	43.089	-0.026	2444	17.259	0.139
	(6934_9422)	(25.647_34.848)	(-0.145_0.167)	(4711_6646)	(36.582_51.603)	(-0.199_0.147)	(1923_2956)	(13.58_20.878)	(-0.067_0.372)
Southern Sub-Saharan Africa	8679	89.148	-0.113	5569	137.813	-0.156	3110	54.614	-0.022
	(7892_9621)	(81.065_98.827)	(-0.193_-0.02)	(4937_6273)	(122.169_155.231)	(-0.248_-0.045)	(2711_3517)	(47.615_61.765)	(-0.141_0.103)
Western Sub-Saharan Africa	6307	19.621	-0.010	4651	30.891	0.021	1655	9.688	0.079
	(5288_7499)	(16.451_23.33)	(-0.131_0.146)	(3909_5520)	(25.96_36.658)	(-0.124_0.203)	(1299_1967)	(7.605_11.512)	(-0.1_0.296)

SDI: socio-demographic index, TBLC: **tracheal, bronchus, and lung cancer,** WHO: World Health Organization

Table 3. Burden of TBLC in ≥55 years old in 2021 and its changes from 2010 to 2021

	Both genders			Males		Changes (2010-2021)	Females		Changes (2010-2021)
	DALY number	DALY rate per 100,000	Changes (2010-2021)	DALY number	DALY rate per 100,000		DALY number	DALY rate per 100,000	
Global	37632985	2532.526	-0.092	25527865	3649.352	-0.133	12105120	1539.174	0.007
	(33897815_41367880)	(2281.166_2783.867)	(-0.175_-0.003)	(22421782_28746491)	(3205.319_4109.472)	(-0.236_-0.015)	(10799610_13346792)	(1373.178_1697.054)	(-0.09_0.111)
SDI									
High SDI	10792988	3128.284	-0.151	6684375	4162.062	-0.206	4108613	2227.971	-0.061
	(10005640_11267790)	(2900.076_3265.902)	(-0.174_-0.13)	(6296548_6982975)	(3920.58_4347.987)	(-0.232_-0.179)	(3677289_4344500)	(1994.077_2355.884)	(-0.089_-0.036)
High-middle SDI	12375134	3569.641	-0.071	8743270	5506.714	-0.135	3631864	1932.845	0.100
	(10857873_14081882)	(3131.983_4061.957)	(-0.185_0.059)	(7333050_10300126)	(4618.525_6487.258)	(-0.279_0.029)	(3071972_4280983)	(1634.875_2278.3)	(-0.077_0.307)
Low SDI	531329	647.505	0.045	383439	953.372	0.014	147891	353.477	0.165
	(450859_625379)	(549.44_762.119)	(-0.085_0.191)	(320621_462061)	(797.185_1148.856)	(-0.122_0.174)	(122508_173716)	(292.81_415.202)	(-0.008_0.383)
Low-middle SDI	2561649	1062.559	0.038	1816661	1571.675	0.017	744988	593.638	0.126
	(2328237_2826848)	(965.741_1172.562)	(-0.08_0.143)	(1659387_2006821)	(1435.609_1736.19)	(-0.117_0.141)	(644455_845617)	(513.529_673.823)	(0.005_0.254)
Middle SDI	11330969	2411.571	-0.038	7872000	3518.392	-0.069	3458969	1405.400	0.064
	(9498761_13120367)	(2021.622_2792.408)	(-0.188_0.118)	(6286261_9507920)	(2809.646_4249.567)	(-0.253_0.143)	(2945011_4042403)	(1196.575_1642.453)	(-0.103_0.274)
World Bank income level									
World Bank high-income	11990750	3113.167	-0.150	7626601	4280.581	-0.209	4364150	2108.335	-0.044
	(11112158_12425474)	(2885.057_3226.034)	(-0.168_-0.134)	(7218473_7867798)	(4051.511_4415.958)	(-0.228_-0.192)	(3896101_4611811)	(1882.219_2227.981)	(-0.068_-0.023)
World Bank low income	504793	958.214	-0.064	360168	1445.697	-0.072	144626	520.844	-0.037
	(390955_643948)	(742.122_1222.361)	(-0.171_0.067)	(275522_473148)	(1105.932_1899.195)	(-0.176_0.082)	(104173_185762)	(375.16_668.99)	(-0.205_0.144)
World Bank lower middle-income	5060236	1192.806	0.034	3684724	1808.179	0.004	1375512	623.960	0.154
	(4403727_5609606)	(1038.053_1322.305)	(-0.098_0.14)	(3223864_4101232)	(1582.024_2012.57)	(-0.135_0.119)	(1133792_1595101)	(514.311_723.571)	(0.017_0.307)
World Bank upper middle-income	20039185	3218.568	-0.056	13830414	4735.493	-0.100	6208771	1878.297	0.068
	(16910136_23501422)	(2716_3774.651)	(-0.208_0.106)	(11037818_16968317)	(3779.316_5809.902)	(-0.284_0.12)	(5149757_7361950)	(1557.921_2227.16)	(-0.125_0.297)
Continents									
Africa	1051133	975.899	-0.013	792427	1538.334	-0.012	258706	460.354	0.050
	(915828_1200187)	(850.278_1114.285)	(-0.119_0.126)	(692495_910200)	(1344.336_1766.967)	(-0.124_0.144)	(217076_297011)	(386.276_528.517)	(-0.105_0.212)
America	5518481	2379.404	-0.210	3130441	2928.981	-0.245	2388040	1909.685	-0.160
	(5156140_5739149)	(2223.173_2474.549)	(-0.23_-0.19)	(2972652_3248259)	(2781.346_3039.217)	(-0.267_-0.224)	(2175171_2509784)	(1739.456_2007.042)	(-0.185_-0.138)
Asia	22589353	2573.068	-0.033	15591105	3688.398	-0.067	6998247	1537.372	0.066
	(19058755_26066482)	(2170.911_2969.135)	(-0.181_0.12)	(12566132_18760446)	(2972.778_4438.171)	(-0.248_0.153)	(5924316_8150802)	(1301.451_1790.565)	(-0.115_0.265)

Table 3. Continued

	Both genders			Males		Changes (2010-2021)	Females		Changes (2010-2021)
	DALY number	DALY rate per 100,000	Changes (2010-2021)	DALY number	DALY rate per 100,000		DALY number	DALY rate per 100,000	
Europe	8418281	3166.436	-0.112	5976514	5097.047	-0.184	2441767	1643.122	0.068
	(7964899_8758645)	(2995.902_3294.46)	(-0.143_-0.084)	(5672625_6243635)	(4837.877_5324.861)	(-0.22_-0.152)	(2238368_2579953)	(1506.25_1736.11)	(0.032_0.103)
WHO Regions									
African Region	678416	814.413	-0.043	480517	1235.253	-0.050	197899	445.708	0.034
	(602331_768340)	(723.075_922.363)	(-0.133_0.07)	(427493_551386)	(1098.945_1417.434)	(-0.149_0.073)	(166748_226701)	(375.55_510.576)	(-0.104_0.183)
Eastern Mediterranean Region	1048108	1407.974	-0.037	838752	2171.564	-0.056	209356	584.524	0.063
	(920181_1208097)	(1236.124_1622.895)	(-0.16_0.107)	(725863_977752)	(1879.291_2531.442)	(-0.189_0.105)	(171894_251043)	(479.929_700.914)	(-0.126_0.255)
European Region	8586034	3085.755	-0.120	6103222	4971.216	-0.191	2482812	1596.908	0.057
	(8131189_8934955)	(2922.287_3211.154)	(-0.15_-0.092)	(5798726_6374982)	(4723.197_5192.57)	(-0.226_-0.16)	(2276653_2623280)	(1464.31_1687.255)	(0.021_0.092)
Region of the Americas	5518481	2379.404	-0.210	3130441	2928.981	-0.245	2388040	1909.685	-0.160
	(5156140_5739149)	(2223.173_2474.549)	(-0.23_-0.19)	(2972652_3248259)	(2781.346_3039.217)	(-0.267_-0.224)	(2175171_2509784)	(1739.456_2007.042)	(-0.185_-0.138)
South-East Asia Region	3451022	1117.280	0.057	2404574	1616.713	0.032	1046448	653.439	0.137
	(2949843_3877262)	(955.022_1255.277)	(-0.096_0.191)	(2076744_2731231)	(1396.297_1836.341)	(-0.143_0.185)	(834081_1239276)	(520.829_773.847)	(-0.017_0.298)
Western Pacific Region	18087358	3624.186	-0.035	12400755	5190.725	-0.070	5686603	2185.714	0.068
	(14967716_21430920)	(2999.1_4294.14)	(-0.202_0.144)	(9580340_15453131)	(4010.152_6468.393)	(-0.279_0.188)	(4628024_6849611)	(1778.836_2632.73)	(-0.145_0.316)
Health System Grouping Level									
Advanced Health System	14400136	3049.014	-0.140	9594310	4488.278	-0.197	4805825	1858.944	-0.030
	(13500388_14917720)	(2858.506_3158.605)	(-0.159_-0.121)	(9133841_9942508)	(4272.867_4651.167)	(-0.22_-0.176)	(4327401_5059018)	(1673.884_1956.882)	(-0.055_-0.01)
Basic Health System	20273158	3059.385	-0.050	13818091	4368.623	-0.084	6455067	1863.733	0.047
	(16921208_23603532)	(2553.549_3561.966)	(-0.203_0.111)	(10895294_16959756)	(3444.574_5361.868)	(-0.27_0.146)	(5389161_7623352)	(1555.98_2201.045)	(-0.143_0.261)
Limited Health System	2759867	836.847	0.047	1971760	1236.972	0.013	788107	462.528	0.187
	(2476217_3086161)	(750.839_935.786)	(-0.104_0.183)	(1748041_2199335)	(1096.624_1379.74)	(-0.15_0.167)	(682644_908593)	(400.633_533.239)	(0.026_0.356)
Minimal Health System	158909	796.401	0.041	115584	1222.644	0.010	43325	412.627	0.113
	(120507_220790)	(603.94_1106.529)	(-0.11_0.222)	(84839_170546)	(897.425_1804.026)	(-0.145_0.198)	(33108_54601)	(315.316_520.022)	(-0.101_0.395)

Table 3. Continued

	Both genders			Males		Changes (2010-2021)	Females		Changes (2010-2021)
	DALY number	DALY rate per 100,000	Changes (2010-2021)	DALY number	DALY rate per 100,000		DALY number	DALY rate per 100,000	
GBD Region									
Central Europe, Eastern Europe, and Central Asia	3436982	3024.001	-0.116	2597087	5586.517	-0.185	839896	1250.434	0.091
	(3243146_3614237)	(2853.456_3179.957)	(-0.162_-0.072)	(2423068_2752545)	(5212.191_5920.919)	(-0.24_-0.138)	(780004_895430)	(1161.268_1333.113)	(0.029_0.156)
Central Asia	225236	1548.039	-0.236	180539	2826.658	-0.272	44697	547.577	-0.129
	(199859_249566)	(1373.625_1715.253)	(-0.315_-0.15)	(158975_200718)	(2489.04_3142.592)	(-0.351_-0.191)	(39419_50226)	(482.909_615.31)	(-0.235_-0.012)
Central Europe	1637723	4422.930	-0.038	1137575	7029.726	-0.125	500147	2399.289	0.205
	(1519791_1740836)	(4104.436_4701.403)	(-0.105_0.022)	(1046989_1216922)	(6469.941_7520.053)	(-0.192_-0.062)	(458229_541753)	(2198.199_2598.876)	(0.112_0.29)
Eastern Europe	1574023	2535.517	-0.135	1278973	5347.074	-0.190	295051	773.196	0.027
	(1421402_1713742)	(2289.666_2760.583)	(-0.215_-0.057)	(1140364_1411538)	(4767.586_5901.3)	(-0.278_-0.105)	(264892_325059)	(694.162_851.833)	(-0.072_0.133)
High-income	10617887	2984.879	-0.153	6690445	4070.107	-0.209	3927442	2052.573	-0.058
Australasia	221657	2509.066	-0.106	129015	3070.831	-0.146	92642	1999.635	-0.047
	(201708_240799)	(2283.253_2725.74)	(-0.173_-0.03)	(117303_141515)	(2792.057_3368.337)	(-0.229_-0.054)	(82235_100662)	(1775.02_2172.759)	(-0.108_0.018)
High-income Asia Pacific	1821752	2583.922	-0.063	1328767	4106.494	-0.093	492985	1292.376	0.002
	(1605467_1950856)	(2277.149_2767.039)	(-0.11_-0.018)	(1215044_1403103)	(3755.04_4336.227)	(-0.135_-0.052)	(391676_555628)	(1026.791_1456.594)	(-0.069_0.065)
High-income North America	3702193	3289.836	-0.226	2030321	3882.771	-0.262	1671872	2775.178	-0.183
	(3456812_3866920)	(3071.786_3436.215)	(-0.246_-0.207)	(1925297_2109910)	(3681.924_4034.977)	(-0.288_-0.239)	(1509181_1764424)	(2505.124_2928.807)	(-0.206_-0.16)
Southern Latin America	333680	2267.447	-0.188	221030	3359.792	-0.257	112649	1384.341	-0.019
	(307219_363305)	(2087.64_2468.757)	(-0.251_-0.111)	(203004_239645)	(3085.782_3642.747)	(-0.323_-0.187)	(101207_124359)	(1243.72_1528.239)	(-0.107_0.09)
Western Europe	4538605	3043.297	-0.132	2981312	4323.758	-0.213	1557293	1942.183	0.044
	(4219045_4755438)	(2829.021_3188.691)	(-0.163_-0.102)	(2802822_3113953)	(4064.897_4516.126)	(-0.246_-0.183)	(1397833_1659560)	(1743.313_2069.725)	(0.005_0.079)
Latin America and Caribbean	1503628	1415.459	-0.090	892265	1831.834	-0.146	611363	1062.868	0.017
	(1385991_1618090)	(1304.72_1523.209)	(-0.144_-0.036)	(826670_958313)	(1697.165_1967.432)	(-0.202_-0.085)	(554373_662268)	(963.789_1151.367)	(-0.048_0.088)
Andean Latin America	109922	1109.598	-0.044	60516	1278.403	-0.068	49406	955.119	-0.007
	(84946_135856)	(857.485_1371.387)	(-0.243_0.168)	(47086_75150)	(994.704_1587.544)	(-0.265_0.166)	(36647_61666)	(708.459_1192.127)	(-0.228_0.244)
Caribbean	201540	2176.819	-0.070	129853	2985.910	-0.090	71687	1460.135	-0.020
	(178389_227376)	(1926.765_2455.877)	(-0.184_0.033)	(113689_146980)	(2614.218_3379.728)	(-0.209_0.018)	(61848_81914)	(1259.747_1668.454)	(-0.136_0.104)
Central Latin America	447580	1046.574	-0.132	268449	1365.641	-0.164	179131	775.161	-0.063
	(394104_508099)	(921.53_1188.086)	(-0.227_-0.023)	(233134_306854)	(1185.987_1561.012)	(-0.272_-0.049)	(153638_207069)	(664.847_896.062)	(-0.182_0.062)

Table 3. Continued

	Both genders			Males		Changes (2010-2021)	Females		Changes (2010-2021)
	DALY number	DALY rate per 100,000	Changes (2010-2021)	DALY number	DALY rate per 100,000		DALY number	DALY rate per 100,000	
Tropical Latin America	744586	1680.864	-0.063	433447	2170.609	-0.150	311140	1278.887	0.100
	(699950_783162)	(1580.098_1767.946)	(-0.103_-0.021)	(407199_457307)	(2039.167_2290.098)	(-0.194_-0.101)	(284939_330791)	(1171.193_1359.659)	(0.045_0.153)
North Africa and Middle East	1425166	1869.467	-0.057	1164707	3018.571	-0.082	260458	691.805	0.056
	(1235874_1644515)	(1621.163_2157.199)	(-0.185_0.096)	(998361_1367526)	(2587.452_3544.217)	(-0.215_0.083)	(218063_303375)	(579.198_805.797)	(-0.131_0.258)
North Africa and Middle East	1425166	1869.467	-0.057	1164707	3018.571	-0.082	260458	691.805	0.056
	(1235874_1644515)	(1621.163_2157.199)	(-0.185_0.096)	(998361_1367526)	(2587.452_3544.217)	(-0.215_0.083)	(218063_303375)	(579.198_805.797)	(-0.131_0.258)
South Asia	1887377	760.135	0.103	1375271	1130.202	0.044	512106	404.471	0.343
	(1585172_2154999)	(638.423_867.919)	(-0.095_0.291)	(1114965_1585848)	(916.281_1303.254)	(-0.168_0.248)	(432833_600824)	(341.86_474.542)	(0.092_0.623)
South Asia	1887377	760.135	0.103	1375271	1130.202	0.044	512106	404.471	0.343
	(1585172_2154999)	(638.423_867.919)	(-0.095_0.291)	(1114965_1585848)	(916.281_1303.254)	(-0.168_0.248)	(432833_600824)	(341.86_474.542)	(0.092_0.623)
Southeast Asia, East Asia, and Oceania	18124029	3568.357	-0.044	12361382	5075.046	-0.075	5762647	2180.031	0.047
	(14918989_21439691)	(2937.331_4221.162)	(-0.216_0.137)	(9504105_15443049)	(3901.972_6340.244)	(-0.285_0.188)	(4712955_6910714)	(1782.929_2614.349)	(-0.165_0.293)
East Asia	15502899	3953.603	-0.044	10532324	5552.328	-0.076	4970575	2455.468	0.056
	(12467252_18831949)	(3179.441_4802.588)	(-0.236_0.166)	(7844220_13557156)	(4135.239_7146.929)	(-0.318_0.224)	(3937268_6141452)	(1945.014_3033.883)	(-0.184_0.342)
Oceania	23751	1924.455	0.045	17139	2651.737	0.032	6612	1124.782	0.093
	(17906_33090)	(1450.868_2681.206)	(-0.146_0.283)	(12523_24470)	(1937.553_3785.944)	(-0.171_0.279)	(4797_9362)	(816.098_1592.629)	(-0.122_0.355)
Southeast Asia	2597379	2267.371	-0.014	1811918	3403.722	-0.030	785460	1280.895	0.015
	(2133351_3004461)	(1862.299_2622.731)	(-0.154_0.123)	(1498353_2137437)	(2814.684_4015.215)	(-0.185_0.128)	(604070_944581)	(985.091_1540.382)	(-0.138_0.182)
Sub-Saharan Africa	637916	818.476	-0.039	446707	1237.409	-0.044	191209	457.008	0.038
	(565855_727509)	(726.018_933.427)	(-0.131_0.077)	(394235_516681)	(1092.057_1431.243)	(-0.147_0.08)	(161649_219338)	(386.357_524.238)	(-0.102_0.191)
Central Sub-Saharan Africa	97294	1078.229	0.099	71677	1738.744	0.056	25617	522.673	0.160
	(68062_145954)	(754.272_1617.479)	(-0.138_0.408)	(47308_115842)	(1147.591_2810.089)	(-0.19_0.342)	(18512_34459)	(377.711_703.078)	(-0.155_0.559)
Eastern Sub-Saharan Africa	188817	698.349	0.003	131554	1021.454	-0.036	57263	404.440	0.138
	(163819_225570)	(605.894_834.283)	(-0.151_0.167)	(111725_159739)	(867.491_1240.292)	(-0.212_0.143)	(44794_69457)	(316.378_490.569)	(-0.07_0.376)
Southern Sub-Saharan Africa	206656	2122.752	-0.116	136927	3388.552	-0.158	69729	1224.518	-0.015
	(187456_229595)	(1925.536_2358.384)	(-0.2_-0.016)	(121076_154957)	(2996.291_3834.761)	(-0.254_-0.043)	(61196_79052)	(1074.656_1388.228)	(-0.137_0.121)
Western Sub-Saharan Africa	145149	451.571	0.000	106549	707.597	0.029	38600	225.926	0.096
	(120032_174006)	(373.428_541.349)	(-0.126_0.165)	(88698_128227)	(589.046_851.563)	(-0.12_0.222)	(29706_46355)	(173.866_271.317)	(-0.097_0.316)

SDI: socio-demographic index, TBLC: tracheal, bronchus, and lung cancer, WHO: World Health Organization, GBD: Global Burden of Disease

The Global Trend of TBLC Among Aged ≥55 Years by Continents

In 2021, approximately 60% of TBLC incidence, death, and DALY cases were recognized in Asian countries, but more TBLC incidence, death, and DALY rates were reported in European countries, with 169.159, 151.834, and 3,166.436 cases per 100,000 population, respectively. While between 2010 and 2021, the TBLC incidence rate (per 100,000) increased by 3.6% in Asia, other continents reported a downward trend of up to 20.9% (America). Males on all continents experienced a decreasing trend in the observed factor, but among women, only America reported a downward trend (17.3%). At this time, the TBLC death and DALY rates (per 100,000) in all continents decreased; the highest decrease was reported in America by 20 and 21%, respectively. Also, males in all continents reported a decreasing trend, but for women, only America experienced a downward trend of 15.9% (Tables 1, 2, 3 and, Figure 1).

The Global Trend of TBLC Among Aged ≥55 Years by Socio-demographic Index

In 2021, most TBLC incidence cases (34.4%) were recorded in high SDI countries. High-middle SDI countries exhibited the highest TBLC deaths (32.2%) and DALYs (32.9%). High SDI countries experienced the highest decreasing trend in TBLC incidence, death, and DALY rates (per 100,000) by a 10.9, 11.2, and 15.1% decrease, respectively, compared to 2010. TBLC incidence rate for males decreased in high and high-middle SDI countries from 2010 to 2021, while only high SDI countries recorded a decreasing trend for females. TBLC death and DALY rates for males increased in low and low-middle SDI countries from 2010 to 2021, while only for females high SDI countries recorded a slight decreasing trend in TBLC death and DALY rates by 3% and 6.1%, respectively (Tables 1, 2, 3 and, Figure 2).

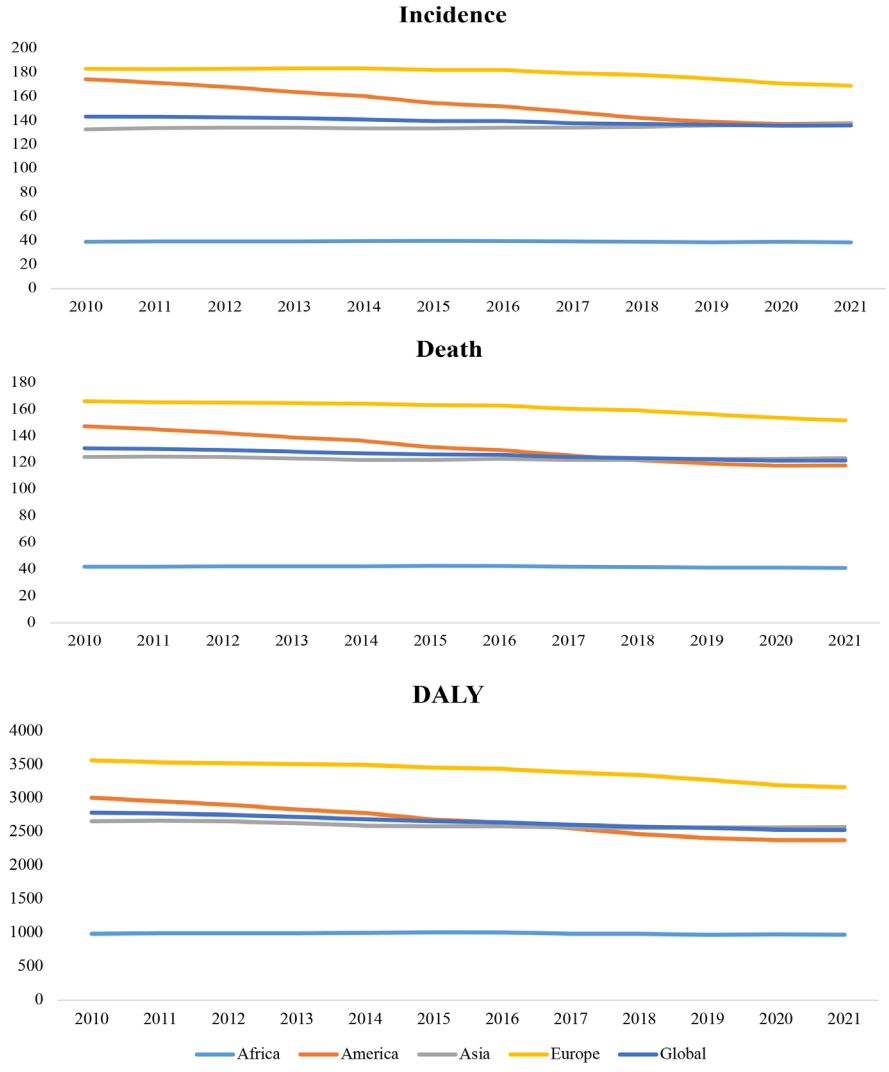

Figure 1. Temporal trend of incidence, death and DALYs rates (per 100,000 population) of TBLC based on continents and comparison with global data from 2010 to 2021

TBLC: tracheal, bronchus, and lung cancer

The Global Trend of TBLC Among Aged ≥55 Years by World Bank Income Levels

In 2021, the highest TBLC incidence, death, and DALYs rates (per 100,000) were reported in World Bank high-income countries with an incidence rate of 193.124, high-income countries with a death rate of 162.533, and upper middle-income countries with DALYs of 3,218.568, respectively. World Bank high-income countries experienced the highest downward trends of 10.7, 11.1, and 15.0% in incidence, death, and DALYs rates (per 100,000) between 2010 and 2021, respectively. The male TBLC incidence rate (per 100,000) decreased in all World Bank groups except World Bank lower middle-income, which reported a stable trend. The male TBLC death and DALY rates (per 100,000) decreased in all World Bank groups, up to 16.9% and 20.9%, in the World Bank high-income group, respectively. The TBLC incidence rate for females increased up to 16.8% in the World Bank upper middle-income countries. The TBLC death and DALY rates for females increased by 13.9% and 15.4%, respectively, in countries classified by the World Bank as lower middle-income (Tables 1, 2, 3).

The Global Trend of TBLC Among Aged ≥55 years in WHO Regions

In 2021, the Western Pacific Region exhibited the highest incidence rate of TBLC for both genders. The region of the Americas experienced a downward trend of 10.7%, 23.7%, and 17.3% for both genders, males, and females in the TBLC incidence rate compared to 2010. The Western Pacific region exhibited the highest death rate of TBLC for both genders. The Region of the Americas experienced a downward trend in TBLC death rates of 20% for both genders, 23.1% for males, and 15.9% for females compared to 2010. The Western Pacific Region exhibited the highest DALY rate of TBLC for both genders. The region of the Americas experienced a downward trend of 21%, 24.5%, and 16% for both genders combined, males, and females, TBLC DALY rate compared to 2010. Female TBLC incidence, death, and DALY rates, in all WHO regions increased, except the region of the Americas (Tables 1, 2, 3 and, Figure 3).

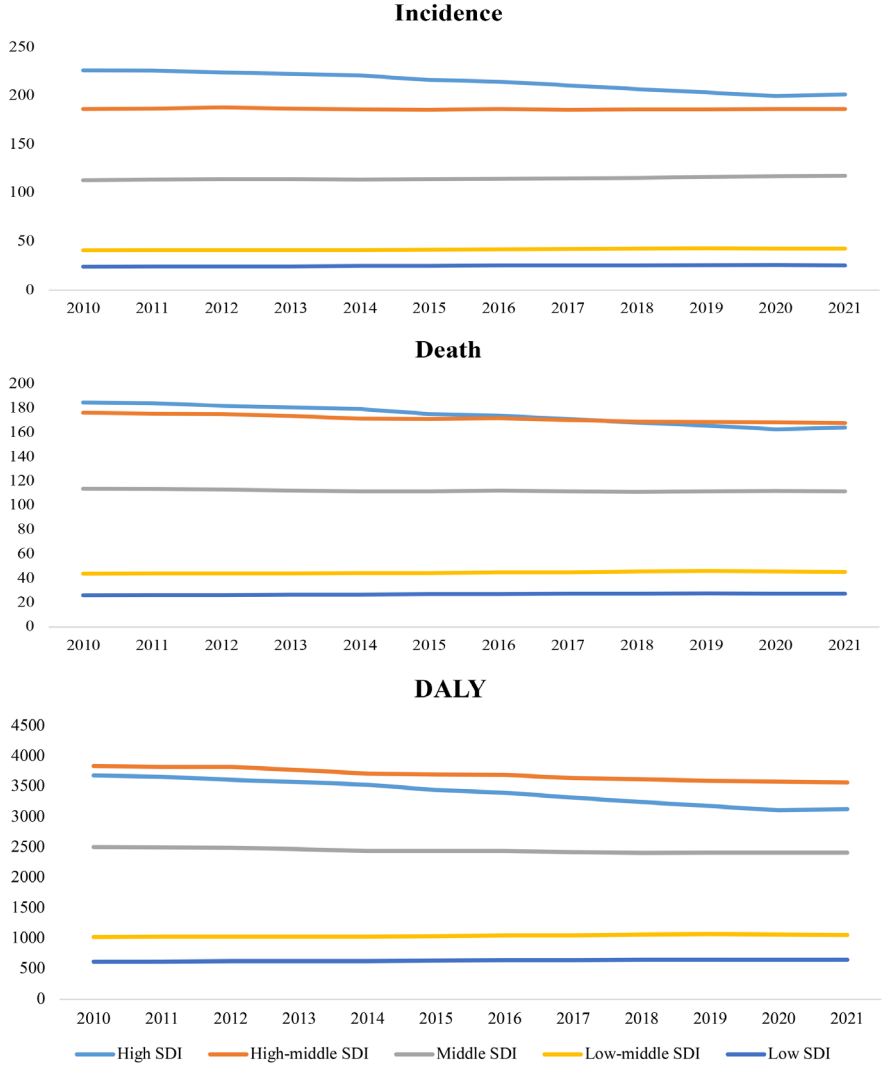

Figure 2. Temporal trend of incidence, death, and DALYs rates (per 100,000 population) of TBLC based on SDI from 2010 to 2021

SDI: socio-demographic index, TBLC: tracheal, bronchus, and lung cancer

The Global Trend of TBLC Among Aged ≥55 Years by Health System Advancement Levels

Countries with Advanced Health Systems reported the highest TBLC incidence, death, and DALY rates with 183.297, 154.404, and 3,059.385 per 100,000 people, respectively, and the highest decreasing trend of 10.3, 10.6, and 14% compared to 2010 for these indicators. In contrast, the most notable increasing trend in TBLC incidence, death, and DALY rates is observed in females living in countries with Limited Health Systems, experiencing respective increases of 19.4%, 18.2%, and 18.7% (Table 1).

The Global Trend of TBLC Among Aged ≥55 Years in GBG Regions

In 2021, among GBG regions, the highest TBLC incidence rate (per 100,000) was allocated to East Asia with 213.477. Between 2010 and 2019, 15, 18, and 6 regions of GBD regions reported a downward trend in TBLC incidence number and rate (per 100,000) for both genders, males, and females, respectively. The highest increase was observed in South Asia (12%), Western Europe (6%), and Central Latin America and the high-income Asia Pacific (35.7%) for both genders, males, and females, respectively. The highest decrease was observed in Central Asia (24.5%), East Asia (27.5%), and North Africa and Middle East and North America (17.8%) for both genders, males, and females, respectively (Table 1, Figures 4, 5).

The highest TBLC death rate (per 100,000) was recorded in Central Europe (201.401). Between 2010 and 2019, 16, 17, and 9 GBD regions reported a downward trend in TBLC death number and rate (per 100,000) for both genders, males, and females, respectively. The highest increase was observed in South Asia, with increases of 11.1%, 5.2%, and 34.2% for both genders, males, and females, respectively. The highest decrease was observed in Central Asia with a 26.1%, 29.4%, and 17.6% decrease for both genders, males, and females, respectively (Table 2, and, Figures 4, 5).

The highest TBLC DALY rate (per 100,000) was recorded in Central Europe (4,422.930). Between 2010 and 2019, 17 GBD regions, 17 for males, and 9 for females reported a downward trend in TBLC DALY number and rate (per 100,000) for both genders, males, and females, respectively. The highest increase

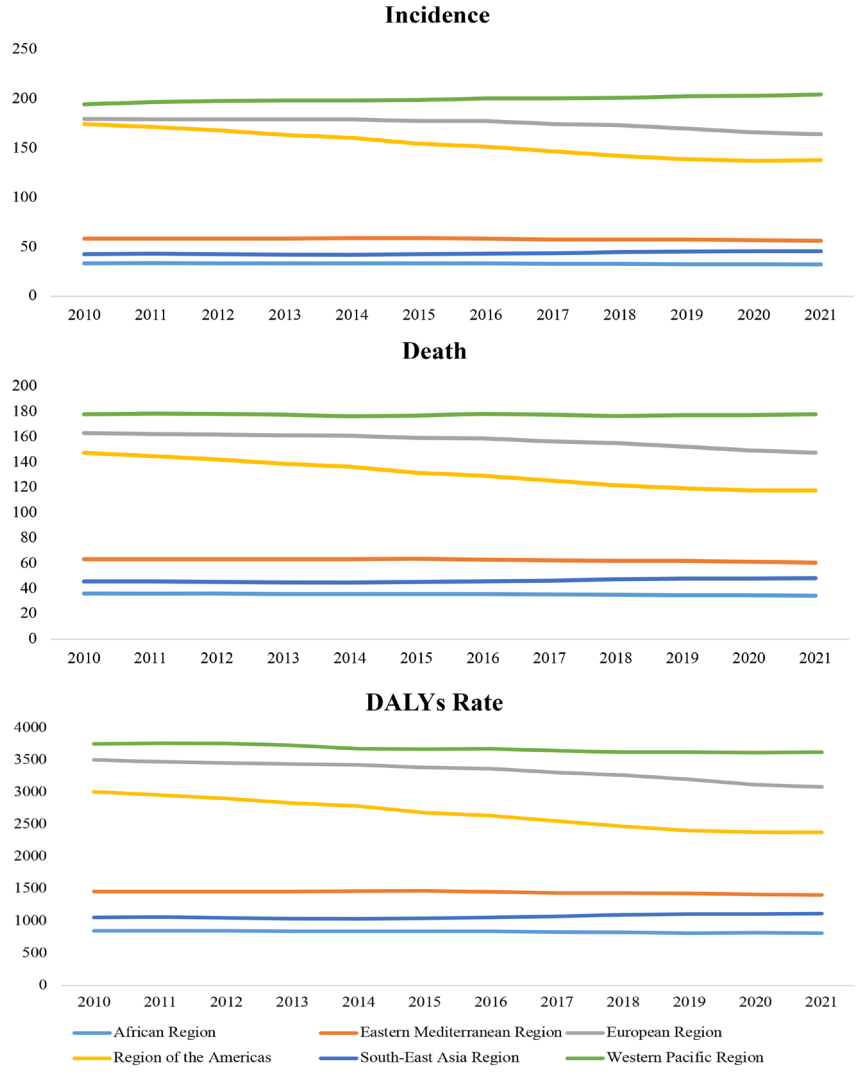

Figure 3. Temporal trend of incidence, death, and DALYs rates (per 100,000 population) of TBLC based on WHO regions from 2010 to 2021

TBLC: tracheal, bronchus, and lung cancer, WHO: World Health Organization

	Incidence			Death			DALY		
	Both	Male	Female	Both	Male	Female	Both	Male	Female
Andean Latin America	51.046	58.751	43.995	54.906	63.182	47.332	1109.598	1278.403	955.119
Australasia	172.707	205.931	142.578	130.792	160.438	103.907	2509.066	3070.831	1999.635
Caribbean	108.453	154.337	67.810	103.231	140.434	70.278	2176.819	2985.910	1460.135
Central Asia	61.052	110.138	22.645	62.605	112.416	23.631	1548.039	2826.658	547.577
Central Europe	202.344	315.904	114.187	201.401	313.870	114.092	4422.930	7029.726	2399.289
Central Latin America	46.983	61.013	35.048	49.904	64.588	37.412	1046.574	1365.641	775.161
Central Sub-Saharan Africa	40.525	64.810	20.100	42.808	68.309	21.359	1078.229	1738.744	522.673
East Asia	213.447	294.799	137.214	189.452	262.100	121.376	3953.603	5552.328	2455.468
Eastern Europe	119.852	245.376	41.172	108.211	221.577	37.151	2535.517	5347.074	773.196
Eastern Sub-Saharan Africa	27.545	40.112	16.114	29.563	43.089	17.259	698.349	1021.454	404.440
High-income Asia Pacific	211.270	323.420	116.137	160.191	244.570	88.615	2583.922	4106.494	1292.376
High-income North America	211.909	239.398	188.049	167.345	193.837	144.350	3289.836	3882.771	2775.178
North Africa and Middle East	76.064	121.381	29.621	81.682	130.314	31.841	1869.467	3018.571	691.805
Oceania	75.821	104.490	44.298	80.941	111.783	47.028	1924.455	2651.737	1124.782
South Asia	30.385	44.856	16.476	32.057	47.285	17.422	760.135	1130.202	404.471
Southeast Asia	93.657	138.841	54.431	98.514	145.629	57.613	2267.371	3403.722	1280.895
Southern Latin America	104.055	151.383	65.792	107.213	156.232	67.584	2267.447	3359.792	1384.341
Southern Sub-Saharan Africa	84.559	131.656	51.137	89.148	137.813	54.614	2122.752	3388.552	1224.518
Tropical Latin America	73.267	94.649	55.717	77.336	99.804	58.895	1680.864	2170.609	1278.887
Western Europe	183.639	254.760	122.479	156.450	220.295	101.547	3043.297	4323.758	1942.183
Western Sub-Saharan Africa	18.177	28.557	9.028	19.621	30.891	9.688	451.571	707.597	225.926

Figure 4. The incidence, death, and DALYs rates (per 100,000) of TBLC among over 55 years people based on GBD regions and genders from 2010 to 2021

TBLC: tracheal, bronchus, and lung cancer, GBD: Global Burden of Disease

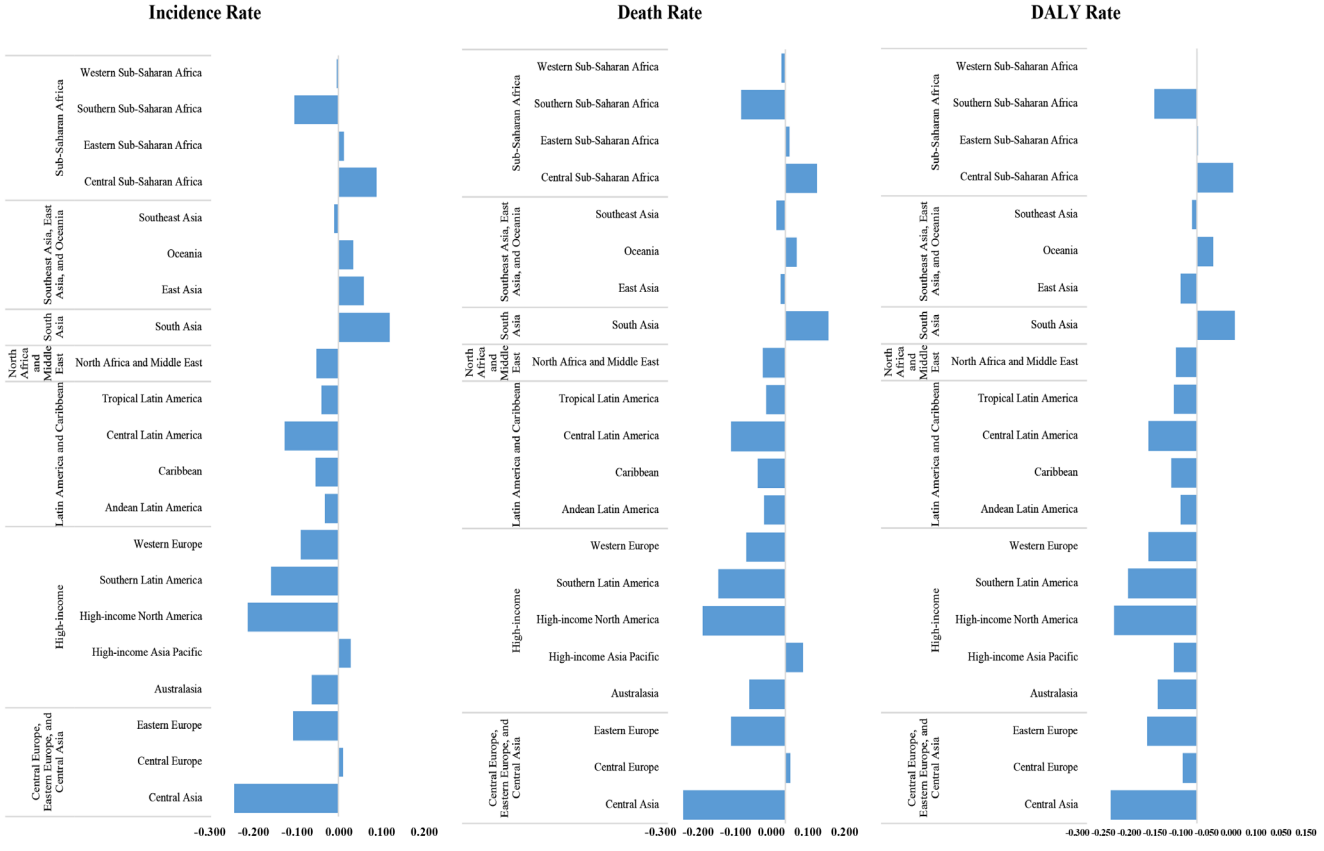

Figure 5. The relative change in incidence, death, and DALYs rates (per 100,000) of TBLC among over 55 years people based on GBD regions and genders from 2010 to 2021

TBLC: tracheal, bronchus, and lung cancer, GBD: Global Burden of Disease

was observed in South Asia (10.3%), Central Sub-Saharan Africa (5.6%), and a third region with an increase of 34.3%, for both genders combined, and separately for males and females, respectively. The highest decreases were observed in Central Asia (23.6% for males (27.2% for females), and high-income North America (18.3% for both genders) (Table 3, and, Figures 4, 5).

National Comparison of the Global Trend of TBLC Among Aged ≥55 Years

In 2021, Monaco, with 414.333, 540.472, and 301.309, exhibited the highest TBLC incidence rates (per 100,000) for both genders, males, and females, respectively. Between 2010 and 2019, 64; 48; and 130 out of 204 countries and territories experienced an increasing trend in TBLC incidence rates (per 100,000) for both genders, males, and females, respectively. The highest increase was observed in Cabo Verde (27.9%) and Bulgaria (43.7%) for both genders, males, and females, respectively. In contrast, the highest decrease was observed in the United Arab Emirates (53.4%) and Kuwait (45.1%) for both genders.

Also, Monaco exhibited the highest TBLC death rates (per 100,000) of 370.074 for both genders, 488.984 for males, and 263.527 for females, respectively. Between 2010 and 2019, 58 43 and 120 out of 204 countries and territories experienced an increasing trend in TBLC death rates (per 100,000) for both genders, males, and females, respectively. The highest increase was observed in Cabo Verde (23.6% for both genders, 28.8% for males), and Bulgaria (45.0% for females). In contrast, the highest decrease was observed in the United Arab Emirates (53.8%), Saudi Arabia (58.7%), and Kuwait (46.4%) for both genders, males, and females, respectively.

Also, Monaco (7,091.097), Monaco (9,522.039), and Greenland (5,583.999) exhibited the highest TBLC DALY rates (per 100,000) for both genders, males, and females, respectively. Between 2010 and 2019, 62, 45, and 125 out of 204 countries and territories experienced an increasing trend in TBLC DALY rates (per 100,000) for both genders, males, and females, respectively. The highest increase was observed in Cabo Verde (36.8%), Cabo Verde (45.2%), and Bulgaria (43.6%) for both genders, males, and females, respectively. In contrast, the highest decrease was observed in the United Arab Emirates (54.1%), United Arab Emirates (58.1%), and Kuwait (46.1%) for both genders, males, and females, respectively.

DISCUSSION

The results of the present study showed that global TBLC incidence, mortality, and DALYs decreased in adults ≥55 years from 2010 to 2021. In 2021, more than 66% of new TBLC cases occurred in men, and the incidence rate declined by 9.6% in men. Contrarily, females experienced a 3.8% increase from 2010. While males account for the majority of TBLC burden, it is important to pay attention to the higher growth rate of women and the associated risk factors.[18]

TBLC mortality is generally increasing among patients aged 70 and older, and, due to the growing geriatric population, managing TBLC in this population is becoming a greater concern.[18] Older patients often have reduced functional reserves and limited ability to receive proper treatments. Moreover, a higher prevalence of underlying diseases results in unfavorable treatment outcomes.[19]

The burden of TBLC is primarily influenced by smoking in both men and women.[20] East Asia, Western Europe, and high-income North America bear a higher TBLC burden due to historical smoking patterns.[21] TBLC mortality typically peaks 30-40 years after the peak smoking prevalence in a population.[21] Therefore, implementing effective approaches to reduce smoking could help reduce the burden of the disease, particularly in low SDI populations.[23] In East Asia, where female smoking rates are low, indoor air pollution from cooking and heating emerges as a major factor in TBLC incidence.[24] This study confirms distinct gender variations in the global burden of TBLC due to occupational carcinogens, aligning with previous studies.[25] Additionally, female TBLC rates increased in World Bank middle-income countries, where smoking among women is steadily rising because it is becoming normalized due to social media, globalization, and marketing efforts.[26] The gender gap could be attributed to variations in smoking rates and biological responses to tobacco between men and women. Exposure to sex hormones and molecular characteristics could heighten women's vulnerability to TBLC.[27]

Air pollution, occupational exposures, second-hand smoking, low fruit intake, and elevated fasting plasma glucose levels are known to contribute to death and DALYs from TBLC.[28] High fasting plasma glucose is an important risk factor among older men in developed countries.[29] Therefore, TBLC screening should be included in routine diabetes assessments.[30]

In 2021, approximately 60% of TBLC cases occurred in Asian countries, while European countries exhibited the highest TBLC incidence rate. In contrast with the global decreasing trend, the TBLC incidence, death, and DALY rates in Asia increased. Rezaei et al.'s[4] study showed a decrease in the age-standardized incidence rate of TBLC in Asia, but our study, which considered a cutoff of ≥55 years and a longer period, found an increase in the TBLC incidence. The high geographical variation observed in the epidemiological rates and trends of TBLC in this study highlights the need for tailored global disease burden control strategies, taking into account the discrepancies in healthcare resources and opportunities for diagnosis and treatment.

There are uneven burdens across the five SDI quintiles, reflecting inequalities in healthcare access. Our study found that TBLC DALY and death rates for males increased in low and low-middle SDI countries, while high and high-middle SDI countries saw a decrease in TBLC DALY and death rates. For females, only high SDI countries showed a decreasing trend in incidence rates. The high death and DALY rates in high-middle SDI countries reflected industrialization and cumulative occupational exposures from decades ago.[31] Previous studies have estimated a 20-fold variation in TBLC incidence rates by region, largely reflecting the maturity of the tobacco epidemic and historical patterns of tobacco exposure, including intensity, duration, cigarette types, and degree of inhalation.[32] Currently, 80% of the world's smokers live in low- and middle-income countries.[33] In low-middle and low SDI quintiles, the top

risk factors for TBLC deaths and DALYs include air pollution, tobacco, and dietary risks.[34] Occupational exposure to silica was the primary risk factor for TBLC in individuals aged 20-39 and 40-59, whereas asbestos exposure was the primary risk for those aged 60-79 and over 80. This difference is likely due to the latency period between exposure and TBLC morbidity.[35] Therefore, occupational asbestos exposure remains a significant risk factor in high SDI countries.[31]

On the other hand, late diagnosis results in poor prognosis for patients. The failure to implement and manage appropriate screening programs in governments and health systems, along with the failure to establish primary prevention laws, leads to increasing trends in all TBLC indicators, especially in women.[36] The American Cancer Society recommends annual low-dose helical computed tomography for TBLC screening in older adults. Effective screening programs can significantly reduce TBLC incidence and mortality.[37] However, differences in equipment, resources, and personnel skills affect early detection rates.[4] Generally, given that TBLC is largely preventable, effective management and intervention by healthcare systems is essential. Moreover, prioritizing early diagnosis is crucial for improving TBLC prognosis.[38] These findings highlight the need for adaptable control strategies tailored to local conditions to mitigate the global burden of this disease.[33]

Interpretation of the results of this study should be interpreted with caution because using online data presents limitations, such as potential errors in stored data, delays in data access, changes in coding practices over time, and reliability gaps in cancer reporting and registries, particularly low-SDI countries.

CONCLUSION

The global burden of TBLC is predominantly in Asian countries (mainly East Asia), with a slower decrease in incidence, death, DALY, and burden rates compared to other regions. Therefore, measures are recommended to reduce the progression of TBLC, such as reducing exposure to risk factors, expanding screening and diagnostic programs, especially for high-risk male smokers, and improving treatment procedures. In addition, more research are needed to investigate the causes of the increasing trend of TBLC in women. controlling related risk factors in women needs urgent and effective preventive interventions.

Ethics

Ethics Committee Approval: The Jahrom University of Medical Sciences Ethical Research Committee approved this study (approval no: IR.JUMS.REC.1401.094, date: 23.11.2022).

Informed Consent: Because utilizing anonymous online datasets, informed consent was not required.

Footnotes

Authorship Contributions

Concept: H.S., A.M., F.R., Data Collection or Processing: A.M., E.S., Z.S., Analysis or Interpretation: H.S., F.S.-S., A.M., Literature Search: A.M., E.S., F.R., F.S.-S., Z.S., L.A., H.S., Writing: A.M., E.S., F.R., F.S.-S., Z.S., L.A., H.S.

Conflict of Interest: No conflict of interest was declared by the authors.

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