Trends and Projection of Burden on Lung Cancer and Risk Factors in China from 1990 to 2060

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Research Article

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Abstract

Background

Lung cancer (LC) is currently the number one malignancy death rate disease in China, and its disease burden is serious. The study aims to analyze trends of LC and its risk factor attributable disease in China from 1990 to 2019 and project the next 40 years.

Methods

The average annual percentage change (AAPC) was used to analyze the trend of LC and its risk factor attributable incidence, death rate and DALYs rate in China from 1990 to 2019, which were collected in the 2019 Global Burden of Disease (GBD2019). In addition, based on the data from 1990 to 2019, an Autoregressive Integrated Moving Average Model (ARIMA) was established for death rate, incidence and disability adjusted life years (DALYs rate) attributed to LC and its risk factors, and the model parameters RMSE, MAE and MAPE were used to evaluate the model.

Results

From 1990 to 2019, the incidence, death rate and DALYs rate of LC showed a rapid rising trend. Among them, the DALYs rate, incidence and death rate of LC patients > 60 years old showed an increasing trend, and the biggest increase was in the age group 85 + years old, which increased by 87.6%, 119.0% and 89.8%, respectively. The top four risk factors in terms of both DALYs rate and death rate in 2019 were smoking, environmental particulate pollution, occupational risk and second-hand smoke. It is found that the death rate and DALYs rate of LC are increasing each year from 2020 to 2060 and the DALYs rate of LC will reach 3349.374/100,000, and the death rate will reach 1919936/100000 by 2060. In addition, the top four rank of DALYs rate and death rate of LC risk factors in China in 2060 are smoking, environmental particulate pollution, high fasting plasma glucose(HFPG) and occupational risk, in which HFPG will increase the most.

Conclusions

The LC burden still increased from 1990 to 2019 in China. And the LC burden that could be attributed to HFPG will continue to increase in the next 40 years and will be the third important factor by 2060. Targeted interventions are warranted to facilitate the prevention of LG and improvement of health-related quality of patients of LC.

1 Background

Lung cancer(LC), as one of the most important malignant tumors affecting people's health, ranks second in incidence and first in death rate in the world [1]. While the incidence and death rate rates of LC have been declining in most Western countries, they are on the rise in China [2]. Through the 2019 China Tumor Registry Annual Report in the 2022 China Health and Health Statistical Yearbook published by the China Health and Health Commission [3] (due to the general lag of data from the China Tumor Registry, the reported data are as of 2019) the incidence of LC is 48.42 per 100000, ranked first in the ranking of malignant tumor deaths in China as shown in Table 1. According to the 2020 Global Cancer Statistics Report, China accounted for 39.4 percent of the 1.8 million LC deaths worldwide. It is estimated that in 2020, China is to have 820000 new LC cases and 710000 deaths [2].

The occurrence and aggravation of LC are influenced by many factors. Studies show that smoking is the leading risk factor for LC [4]. Despite a series of tobacco control measures, smoking is still the leading cause of death for LC patients in China [5]. In addition, with the development of society, the change of people's diet structure [6], second-hand smoke [7], ambient fine particulate matter (especially ambient PM$_{2.5}$) [8], occupational carcinogens such as radon, asbestos, silica exposure [9-10], and high fasting plasma glucose (HFPG) (defined as high fasting blood glucose [11]) also have a non-negligible impact on the occurrence and aggravation of LC [12]. Therefore, understanding the disease burden of LC and the trends of risk factors can provide important information for effective prevention and treatment of cancer.

However, little was known in regarding the time trend of attributed risk factors on the burden of lung cancer was analyzed in terms of age groups in China. In this study, based on the most updated data from Global Burden of Disease (GBD) 2019, we analyzed the LC incidence, death rate and DALYs rate, and risk factors in China in 1990–2019 and compared the characteristics of different ages. Then projected the LC burden attributed to risk factors for the next 40 years in terms of age groups, so as to help the government understand the problems faced by malignant tumors on patients in terms of policies, services and technologies, and provide guidance for the government to develop more precise policies and measures.
Table 1
Top 10 malignant tumor death rate in China (Source: 2019 China Tumor Registry Annual Report)

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Death rate (1/100000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung cancer</td>
<td>48.42</td>
</tr>
<tr>
<td>Liver cancer</td>
<td>24.69</td>
</tr>
<tr>
<td>Stomach cancer</td>
<td>21.62</td>
</tr>
<tr>
<td>Esophagus cancer</td>
<td>14.84</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>14.10</td>
</tr>
<tr>
<td>Female breast cancer</td>
<td>10.14</td>
</tr>
<tr>
<td>Pancreatic cancer</td>
<td>6.32</td>
</tr>
<tr>
<td>Cervical cancer</td>
<td>5.47</td>
</tr>
<tr>
<td>Prostatic cancer</td>
<td>4.85</td>
</tr>
<tr>
<td>Cerebral cancer</td>
<td>4.29</td>
</tr>
</tbody>
</table>

2 Methods

2.1 Data Source

The data for this study were obtained from GBD 2019, which assesses the burden of disease for LC in China. GBD is a research project co-sponsored by the World Health Organization (WHO) and the Institute for Global Health (IHME) to assess the health status of national populations worldwide. GBD uses a variety of data sources, including censuses, cause-of-death statistics, and clinical diagnoses, are used to study and assess the health status of countries through statistical and epidemiological methods.

2.2 Indicators

The series of indicators on disease burden assessment were downloaded from the Global Health Data Exchange database (http://ghdx.healthdata.org/gbd-results-tool). In this study, incidence, death rate, and disability-adjusted life years (DALYs rate) were used as the main indicators of disease burden measurement. The three indicators of death rate, incidence, and DALYs rate were chosen for disease burden analysis because they can reflect the impact of diseases on different aspects of population health, including lethality, prevalence level, and overall impact; at the same time, these three indicators can corroborate each other and provide comprehensive reference information for disease prevention and treatment. DALYs rate refers to the total number of Years of healthy Life Lost from onset to death, including Years of Life Lost (YLL) due to early death and Years Lived with Disability (YLD) due to disease\(^{[13]}\). The calculation formula is DALYs rate = YLL + YLD. DALYs rate is an indicator to comprehensively assess the impact of diseases and injuries on health, which can compare the impact of different health problems on human health to different degrees, and provide an important reference for decision makers when formulating health policies\(^{[14]}\).

2.3 Statistical Analysis

The database was preliminarily processed by Excel 2019 software, and the data were further processed by Joinpoint Regression Program 5.0.0.1, RStudio 4.3.0 and IBM SPSS Statistics 27.0.1 respectively. The ARIMA model of the latter time series prediction analysis was used for simulation\(^{[15]}\). Finally, the ARIMA model was used to fit the disease burden attributed to LC and its risk factors in Chinese residents from 1990 to 2019, and to predict the death rate and DALYs rate from 2020 to 2060.

The R software was used to collate and analyze the relevant data of LC in China, and the incidence, death and DALYs rate of LC and its risk factor attribution in 1990 and 2019 were described by year. The Joinpoint 5.0.0.1 software was used for time trend analysis. The mean AAPC and its 95% CI were estimated by Joinpoint model to analyze the changing trend of disease burden of lung cancer and its risk factors in China from 1990 to 2019\(^{[16]}\). AAPC is an indicator that assesses the rate of growth of time series data used to analyze trends in disease incidence or death rate over a specific time period\(^{[17]}\). The size of AAPC can be used to indicate the rate of change of indicators and the degree of trend change. When AAPC is positive, it indicates that the index shows an increasing trend over time, otherwise, it shows a decreasing trend over time. An AAPC of 0 indicates no significant change in the indicators during the time period\(^{[18]}\).

3 Results

3.1 Trends of LC Burden among Chinese Residents from 1990 to 2019

3.1.1 Trends of Disease Burden by Gender
Table 2 shows the increasing of incidence, death rate and DALYs rate of lung cancer in Chinese male and female from 1990 to 2019. The three indicators of LC burden in China showed that the male burden was larger than the whole population, while the female burden was smaller. From 1990 to 2019, the three disease burden indicators of LC in Chinese residents as a whole and at different ages showed a rapid increase trend, and the increase rate was more than 100%, among which the increase rate of LC incidence was more than 150% (Table 2).

<table>
<thead>
<tr>
<th>Year</th>
<th>incidence (1/100,000)</th>
<th>death rate (1/100,000)</th>
<th>DALYs rate (1/100,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>all</td>
<td>male</td>
<td>female</td>
</tr>
<tr>
<td>2019</td>
<td>58.560</td>
<td>79.496</td>
<td>36.806</td>
</tr>
<tr>
<td>Rate of change</td>
<td>1.697</td>
<td>1.710</td>
<td>1.704</td>
</tr>
<tr>
<td>AAPC (%)</td>
<td>3.391</td>
<td>3.375</td>
<td>3.362</td>
</tr>
</tbody>
</table>

Table 2 The increasing burden of LC among different genders in China from 1990 to 2019

3.1.2 Trends of Disease Burden by Age Group

From the perspective of age, the peak age-specific DALYs rate, incidence and death rate of LC in China from 1990 to 2019 showed a backward movement. Compared with 1990, the age-specific DALYs rate, incidence and death rate of LC in Chinese residents in 2019 showed a decreasing trend for those aged 15-59, but an increasing trend for those aged > 60. The DALYs rate, incidence and death rate of LC patients aged 70-74 years, 75-79 years, 80-84 years and >85 years were significantly increased compared with 1990. The DALYs rate (35.1%, 35.3%, 79.8%, 87.6%), incidence rate (55.9%, 77.6%, 108.7%, 119.0%) and death rate (35.1%, 53.7%, 80.7%, 89.8%) were increased, respectively. (Figure 1)

3.1.3 Trend of DALYs rate and death rate caused by 8 risk factors of LC

3.1.3.1 Overall Trends of risk factors

Among the eight risk factors associated with LC, the DALYs rate and death rate of LC only decreased due to household air pollution caused by solid fuels in China from 1990 to 2019, while others were increased, as shown in Figure 2. Among the attributable risk factors for LC, the increase of DALYs rate and death rate was the highest for environmental particulate pollution, details were shown in Table 3.

3.1.3.1 Trends of risk factor sequence

Table 2 shows the details of disease burden of different attributable risk factors for LC in China from 1990 to 2019. In 1990 and 2019, the DALYs rate and death rate of smoking always ranked the first. In 1990, the top four DALYs rate and death rate rates of LC risk factors in China were smoking, household air pollution caused by solid fuels, environmental particulate pollution and occupational risk, and in 2019, The top four DALYs rate and death rate rates of LC risk factors in China were smoking, environmental particulate pollution, occupational risk and second-hand smoke.

Table 3 Trends of disease burden of different attributable risk factors for LC in China from 1990 to 2019

Note: 1, 2, 3, 4, 5, 6, 7, 8 represent the eight risk factors of LC in China
<table>
<thead>
<tr>
<th>Risk factor</th>
<th>DALYs rate rate(per 100k)</th>
<th>Deaths rate(per 100k)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Rate of change</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>2019</td>
</tr>
<tr>
<td>Smoking</td>
<td>332.938&lt;sup&gt;1&lt;/sup&gt;</td>
<td>755.910&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Secondhand smoke</td>
<td>46.400&lt;sup&gt;5&lt;/sup&gt;</td>
<td>94.806&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diet low in fruits</td>
<td>31.003&lt;sup&gt;6&lt;/sup&gt;</td>
<td>43.283&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ambient particulate matter pollution</td>
<td>62.373&lt;sup&gt;3&lt;/sup&gt;</td>
<td>271.201&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Household air pollution from solid fuels</td>
<td>130.219&lt;sup&gt;2&lt;/sup&gt;</td>
<td>59.724&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>Residential radon</td>
<td>22.257&lt;sup&gt;8&lt;/sup&gt;</td>
<td>45.570&lt;sup&gt;7&lt;/sup&gt;</td>
</tr>
<tr>
<td>High fasting plasma glucose</td>
<td>29.194&lt;sup&gt;7&lt;/sup&gt;</td>
<td>77.875&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>Occupational risks</td>
<td>49.567&lt;sup&gt;4&lt;/sup&gt;</td>
<td>106.153&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

3.2 ARIMA model prediction of the overall burden of LC and 8 risk factors in China from 2020 to 2060

3.2.1. ARIMA model evaluation

Based on the data of Chinese residents with lung cancer from 1990 to 2019 in GBD, the ARIMA model of DALYs rate and death rate of lung cancer was established, and the data from 1990 to 2019 were compared with the model fitting values to evaluate the model effect. Among the parameters of the ARIMA model, the MAPE (%) of the DALYs rate and death rate of lung cancer were both lower than 15%, 0.634% and 0.689%, respectively, and the RMSE and MAE values were both small (Table 4 for model parameters), suggesting that the model had a good prediction accuracy.

3.2.2. ARIMA model prediction

The constructed ARIMA prediction model was used to predict the overall burden of LC and 8 risk factors in China during 2020-2060. The model parameters are shown in Table 3. It can be found that the overall DALYs rate and death rate of LC in China will increase year by year from 2020 to 2060 as shown in Table 5.

The prediction of the DALYs rate and death rate of eight risk factors related to LC from 2020 to 2060 shows that the DALYs rate and death rate of LC caused by household air pollution caused by solid fuel decrease, other factors increase, in which the environmental particulate pollution increased the most, increasing by 633.40% and 853.32%, respectively. (Table 5)

It is predicted that in 2020, 2040 and 2060, the DALYs rate and death rate of smoking and environmental particulate pollution will always be the first and second place. The details was shown in Table 5.

According to the ranking prediction of LC risk factors in China from 2020 to 2060, HFPG has the biggest change, rising by 2 places, and may become the third risk factor threatening LC(Table 5).
### Table 5 Predicted values of ARIMA model for the burden of LC in China from 2020 to 2060

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>DALYs rate (per 100k, 95% CL)</th>
<th>Deaths rate (per 100k, 95% CL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All risks</td>
<td>1239.584 (1219.318, 1260.107)</td>
<td>55.172 (54.205, 56.153)</td>
</tr>
<tr>
<td>Smoking</td>
<td>778.858 (765.346, 792.552)</td>
<td>35.843 (35.196, 36.499)</td>
</tr>
<tr>
<td>Secondhand smoke</td>
<td>97.851 (96.331, 99.391)</td>
<td>4.323 (4.249, 4.397)</td>
</tr>
<tr>
<td>Diet low in fruits</td>
<td>43.985 (43.223, 44.757)</td>
<td>1.955 (1.919, 1.991)</td>
</tr>
<tr>
<td>Ambient particulate matter pollution</td>
<td>283.076 (277.048, 289.204)</td>
<td>12.655 (12.382, 12.934)</td>
</tr>
<tr>
<td>Household air pollution from solid fuels</td>
<td>55.352 (54.069, 56.657)</td>
<td>1.293 (1.098, 1.498)</td>
</tr>
<tr>
<td>Residential radon</td>
<td>46.880 (46.117, 47.652)</td>
<td>1.445 (1.319, 1.572)</td>
</tr>
<tr>
<td>High fasting plasma glucose</td>
<td>81.146 (78.762, 83.585)</td>
<td>3.895 (3.783, 4.008)</td>
</tr>
<tr>
<td>Occupational risks</td>
<td>109.583 (107.348, 111.853)</td>
<td>4.594 (4.489, 4.701)</td>
</tr>
</tbody>
</table>

Note: 1, 2, 3, 4, 5, 6, 7, 8 represent the eight risk factors of LC in China

### 3.3 Trends in disease burden of the top three risk factors for lung cancer predicted by age-group attribution from 1990 to 2060

The previous prediction of lung cancer-related risk factors showed that the top three in terms of DALYs rate and mortality of lung cancer risk factors in China in 2060, smoking, ambient particulate matter pollution, HFPG, and the changes of disease burden caused by different age groups of lung cancer patients were analyzed from 1990 to 2060.
From 1990 to 2019, the DALYs rate and death rate attributed to smoking of lung cancer showed an increasing trend in patients over 60 years old, and increased significantly in the age group of 75+ years old, while showed a decreasing trend in the population below 60 years old. The age group with the highest DALYs rate increased from 65-79 years old in 1990 to 70-84 years old in 2019. From 1990 to 2019, the DALYs rate and death rate attributable to environmental particulate pollution of lung cancer showed an increasing trend in all age groups, among which the DALYs rate increased significantly in patients over 50 years old, while the DALYs rate rose gently in patients under 50 years old. The age group with the highest DALYs rate increased from 65-79 years old in 1990 to 70+ years old in 2019. From 1990 to 2019, the DALYs rate and death rate attributed to HFPG of lung cancer showed an increasing trend in all age groups, among which the DALYs rate increased significantly in patients over 60 years old, while the DALYs rate rose gently in patients under 60 years old. The age group with the highest DALYs rate increased from 65-79 years old in 1990 to 70-84 years old in 2019. From 1990 to 2019, the age group with the highest death rate attributable to smoking, environmental particulate pollution and HFPG was always in the age group 75+, among which smoking was the most serious cause in the age group 75+, followed by environmental particulate pollution.

According to the disease burden prediction model established above, by 2060, the age group with the highest rates of DALYs attributable to smoking, ambient particulate matter pollution, and HFPG for lung cancer will be 75+ years old. From 1990 to 2060, the age group with the highest mortality rates attributable to smoking, ambient particulate matter pollution, and HFPG was always 75+ years old. Among them, the DALYs rate and mortality rate in the 75+ age group were the most serious caused by smoking, followed by ambient particulate matter pollution.

4 Discussion

Based on data from GBD2019 data, we found that the incidence, death rate and DALYs rate of LC in males are higher than those in females. From 1990 to 2019, both male and female LC incidence, death rate, DALYs rate showed an increasing trend, and the range of changes in male was higher than that in female. This trend may be explained by changes in smoking rates, which have remained stable or even risen among men in many low- and middle-income countries\(^\text{19}\). Smoking is the main pathogenic factor of LC\(^\text{20}\), our prediction analysis also shows the DALY rate and death rate of smoking always ranked first among the risk factors of LC. Studies show that one million premature deaths a year in China are linked to direct exposure to tobacco\(^\text{21}\), with large numbers of smokers and high rates of smoking among adults, especially men\(^\text{22, 23}\). Another possible reason is that men and women have different susceptibilities to tobacco carcinogens\(^\text{19}\). However, studies have shown that Chinese male non-smokers also have a higher risk of LC than female non-smokers\(^\text{19}\), while in the Western population, the risk of non-smoking men is quite low, no higher than women\(^\text{24, 25}\). Differences in other risk factors such as exposure to second-hand smoke, lifestyle and genetic factors may also influence the burden of LC in men and women. At the same time, this indicates that China should continue to strengthen the implementation and improvement of tobacco intervention policies and measures to protect non-smoking population and effectively reduce the burden of LC.

In terms of age, 60 years old is a dividing line. From 1990 to 2019, the age group of 15–59 years old shows a decreasing trend, while the age group of > 60 years old shows an increasing trend, and the older the age, the higher the incidence, prevalence and DALYs rate. This may be because exposure to risk factors is low in young age and gradually peaks with age\(^\text{10}\), so more measures should be designed for early prevention to reduce the disease burden of LC.

Compared with 1990, DALYs rate and death rate of environmental particulate pollution increased the most among the risk factors for LC in Chinese residents, rising from the third in 1990 to the second in the list of risk factors for LC, and ranking the second in the prediction analysis from 2020 to 2060. The change is likely to be linked to China's urbanization, which has led to a surge in emissions from factories and vehicles, leading to increased air pollution\(^\text{26}\). Research evidence shows that outdoor air pollution has become the fourth largest risk factor for death in China, causing 1.2 million premature deaths\(^\text{27}\). In addition, in rural China, many households still use solid fuels for cooking and heating, which further exacerbates air pollution\(^\text{21}\). This shows that China's air pollution control needs to be strengthened, especially the control of environmental particulate pollution.

The results of this study also showed that the main risk factors contributing to the burden of LC among Chinese residents in 2019 were smoking, environmental particulate pollution and second-hand smoke. By 2060, the main risk factors for LC burden in China are smoking, environmental particulate pollution and HFPG. HFPG is expected to become a third risk factor for LC disease in the future. One of the most common manifestations of HFPG is diabetes\(^\text{28}\), and several clinical and epidemiological studies have shown that pre-existing diabetes has a negative impact on LC death rate, which had significantly poorer overall survival compared with lung cancer but without diabetes\(^\text{29–32}\). From 1990 to 2019, the age-standardized prevalence, death and DALYs rates of diabetes were significantly increased of 49%, 10.8% and 27.6%, respectively\(^\text{33}\). Diabetes is more common in people over 60 and in low- and middle-income countries\(^\text{28}\). The analysis of the changing trend of disease burden attributed to HFPG in LC patients of different age groups showed that DALYs rate and death rate attributable to HFPG in LC patients showed an increasing trend in all age groups from 1990 to 2019. The highest DALYs rate age group was 75–79 years old, and the highest death rate age group was 85+ years old. The rising prevalence of diabetes in older people may explain this. Studies show that the global point prevalence of type 2 diabetes increased with age up to the 75–79 years age group\(^\text{29, 33}\). Besides, complications and immune aging also may lead to high incidence and death rate of LC in this age group\(^\text{30}\). Therefore, this suggests that in the future, attention should be paid to the control of HFPG, and diabetes screening and blood sugar management should be strengthened, especially in the elderly.

There are also some limitations in this study. Due to data limitations, LC data of different provinces (municipalities directly under the Central Government, autonomous regions) and urban and rural areas in China were not studied. At the same time, longer forecast years lead to less accurate
prediction accuracy (prediction interval), and therefore, the disease burden of LC as a whole and attributable risk factors may be less accurate.

5 Conclusion

The LC imposed a substantial incidence, death rate and DALYs rate burden upon China from 1990 to 2019, especially among the elderly. It is expected that by 2060, the highest age groups of DALYs and mortality due to smoking, ambient particulate matter pollution and HFPG will reach the 75+ age group, with increased disease burden in higher age patients. In this study, smoking remains one of the leading causes of high mortality from lung cancer. Also, what need to be emphasized is that the LC burden that could be attributed to HFPG will lead to increasing death rate and DALYs rate in the next 40 years. It may will be the third important factor by 2060. HFPG is usually closely associated with diabetes, and the occurrence of LC combined with diabetes will increase the burden of LC. Therefore, health authorities should implement early prevention to reduce the LC burden. The comprehensive promotion of tobacco control compliance proposed in the “Healthy China 2030” and tobacco control efforts should be strictly implemented. Moreover, health policy makers need to urgently targeted to stem the growth of LC burden caused by HFPG, by appealing people eating healthily and implementing diabetes prevention program.

Abbreviations

LC: Lung Cancer
AAPC: The Average Annual Percentage Change
GBD: Global Burden of Disease
ARIMA: Autoregressive Integrated Moving Average Model
DALYs rate: Disability Adjusted Life Years
WHO: World Health Organization
IHME: Institute for Global Health
YLL: Years of Life Lost
YLD: Years Lived with Disability
HFPG: High Fasting Plasma Glucose

Declarations

Ethical Approval
This research did not include patient participation and so ethics approval was not required.

Competing interests
All authors declare no competing interests.

Authors’ contributions
BH and XZ contributed equally to this work and coordinated the project. They conducted the database search, screened, extracted the data, prepared figures 1-2, prepared table 1-5, and wrote the first draft. All authors have made substantial contributions to the conception of the work, data collection, analysis, interpretation of data, and approved the final version to be published. All authors read and approved the final manuscript.

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Availability of data and materials
The datasets generated for this study can be found in the Global Health Data Exchange database at http://ghdx.healthdata.org/gbd-results-tool. We appreciate the works by the 2019 Global Burden of Disease study collaborators.
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Figures

Figure 1

*Trends in the disease burden of LC among different age groups in China from 1990 to 2019 DALYs rate (A), Incidence rate(B), Death rate(C)*

Figure 2

*Trends in disease burden of different attributable risk factors for LC in China, 1990-2019 DALYs rate (A) Death rate(B)*