SciForschen
Open HUB for Scientific Research

ISSN 2381-3318

International Journal of Cancer Research and Molecular Mechanisms

Research Article | Volume: 3.2 | Open Access

Economic and Disease Burden of Cancers in Chongqing, China, 2013

Zimin Wei[1], Xiaoyan Wen[2#], Anlong Sun[3], Xiaolan Xu[4], Tao Tan[4], Yuchen Xu[4] and Bin Peng[1*]

[1]*School of Public Health and Management, Chongqing Medical University; Research Center for Medicine and Social Development; Innovation Center for Social Risk Governance in Health, Chongqing, China*
[2]*The Third People's Hospital of Chengdu, Sichuan Province, China*
[3]*Chongqing Cancer Hospital, Chongqing, China*
[4]*Chongqing Health Information Center, Chongqing, China*

***Corresponding author:** Bin Peng, School of Public Health and Management, Chongqing Medical University, Chongqing, China, **E-mail:** pengbin@cqmu.edu.cn

#Co-first author: Xiaoyan Wen, The Third People's Hospital of Chengdu, Sichuan Province, China.

Received date: 08 Sep 2017; **Accepted date:** 28 Sep 2017; **Published date:** 05 Oct 2017.

Citation: Wei Z, Wen X, Sun A, Xu X, Tan T, et al. (2017) Economic and Disease Burden of Cancers in Chongqing, China, 2013. Int J Cancer Res Mol Mech 3(2): doi http://dx.doi.org/10.16966/2381-3318.136

Abstract

Background: Cancer is a group of severe diseases with high mortality and disability, causing great personal suffering among patients and creating a huge burden to the society. This study aimed to analyze the economic and disease burden of cancers in Chongqing, and to provide scientific evidence for effective prevention and control of cancers.

Methods: The burden of cancers was estimated by the use of disability-adjusted life year (DALY). Two-step method was adopted to calculate the direct economic burden of cancers. DALY and the human capital method were used to measure the indirect economic burden.

Results: DALY loss by all cancers for the residents in Chongqing in 2013 was 19.86 person year per thousand persons (24.26 for male, 12.83 for female). The five leading causes of cancer burden were lung cancer, liver cancer, esophagus cancer, stomach cancer and colorectal cancer for male, while for female the third one was breast cancer. The total economic burden of cancers was 14.787 billion CNY in Chongqing in 2013, which was mainly attributed to lung cancer, liver cancer, colon and rectal cancer, breast cancer and esophagus cancer. The direct and indirect economic burden were 2.822 billion CNY and 11.965 billion CNY, respectively.

Conclusions: Cancers bring a heavy economic and disease burden to the family and society. Measures should be timely taken to prevent and control cancers, especially for lung cancer, liver cancer, breast cancer, colorectal cancer and esophagus cancer.

Keywords: Cancer; Disease burden; Economic burden; Disability-adjusted life year

Abbreviations: DALY: Disability-Adjusted Life Year; GBD: Global Burden of Disease; YLL: Years of life lost; YLD: Years lived with disability; ICD-10: International Classification of Diseases 10th Revision; CNY: Chinese Yuanp; GDP: Gross Domestic Product

Introduction

Chongqing's industries were developed quite early, now there are 2 pillar industries which are auto/motorcycle and chemicals/pharmaceuticals. Also high-tech industries such as electronic information, bioengineering, pollution control, optoelectronic integration and new materials are being developed rapidly, which become Chongqing new source of growth. Cancers are chronic diseases which pose serious threats to the life quality of human beings and lead to huge costs to the society. In recent years, with the rapidly ageing population and the spread of cancer-related unhealthy behaviors, cancers is one of the leading causes of mortality in the Western world and China [1,2]. Some studies reported that cancer was the leading cause of deaths for male and the second for female in China, and the deaths caused by cancers accounted for 5% of all deaths in 2010 [3]. Moreover, Studies also found that the total economic loss caused by cancer was $107.596 billion which was 0.51% of the GDP and 4.67% of total medical cost in China in 2006 [4,5]. All these data contribute to the fact that cancer now is a serious public health problem in China. Therefore, cancer registration and comprehensive assessment of economic and disease burden of cancer may play an important role in effective health planning.

The disease burden can be evaluated from different aspects with several indicators. The classical indicators are morbidity, mortality and survival [6]. However, these summary indicators were not age-adjusted. Global Burden of Disease (GBD) introduced a new indicator in 1990-disability-adjusted life years (DALY) [7,8], including years of life lost (YLL) and years lived with disability (YLD). However, the YLD is difficult to be estimated since lack of some epidemiological data, such as incidence, duration and prevalence [9]. In the study of economic burden, the direct costs were easiest to be learned as explicit costs. Two-step method was adopted in the calculation of direct economic burden of cancer [10], some countries have reported the cost of disease. Unfortunately, most of these studies failed to take non-hospitalized cases into consideration [11,12]. In our study, the total economic burden of cancer consisted of two parts, the first one was direct costs, which included direct non-medical costs and direct medical costs, and the second was indirect costs, which was due to work time and work ability. In conclusion, our study aimed to comprehensively assess the cancer burden.

Materials and Methods

Disease burden

The death data on cancer in 2013 was mainly retrieved from Chongqing national registries. Population data was derived from the Chongqing Statistical yearbook. Cost information was retrieved from the Fifth National Health Service Survey in Chongqing. In our study, some parameters of GBD were referenced [13]. Ages were classified into 0-4, 5-14, 15-29, 30-44, 45-59, 60-69, 70-79, 80+. The diagnosis of disease was determined according to International Classification of Diseases 10th Revision (ICD-10). DALY includes YLL and YLD.

$$DALY = YLL + YLD$$

YLL was estimated by the widely used formula in this study. Some parameters were referenced which were recommended by Global Burden Disease Study. We used the standard life expectancy at birth (according to the GBD study, 80.0 years for male, 80.0 years for female). The discount rate is 3%. We also took the age weight into consideration, and the default value is 0.04. The age-weight modulation factor and adjustment constant are 1 and 0.1658, respectively. The formula is as follows.

$$YLL = \frac{KCe^{ra}}{(r+\beta)^2}\left[e^{-(r+\beta)(L+a)}[-(r+\beta)(l+a)-1] - e^{-(r+\beta)a}[-(r+\beta)a-1]\right] + \frac{1-K}{r}(1-e^{-rL})$$

where K=Age-weight modulation factor; C=Adjustment constant; β=Age–weight function; r=Discount rate; a=Age at death; L=Life expectancy at age a.

According to the death data and population data, YLL could be easily calculated. The YLD was calculated by the indirect method. We found that the YLL of Chongqing was 54.78/1000~55.98/1000, which similar to 55.14/1000 of YLL of establish market economic countries (EME), and the correlation coefficient of YLL was 0.98 between the two region, so the YLD was estimated by YLL/YLD rate. The formula is as follows.

$YLD_{Chongqing(i\ j)} = YLD_{EME(i\ j)} / YLL_{EME\ (i\ j)} \times YLL_{EME\ (i\ j)}$ Where i=Age; j=Gender.

Direct economic burden

Economic burden includes outpatient and hospitalization cost. The two-step model was adopted to estimate the cost burden. The exchange rate of RMB against the U.S. dollar is 0.1639. The formula is as follows:

Outpatient cost $=p_1 \times a \times r_1 \times 26$

Hospitalization cost $=p_2 \times a \times r_2$

Where p_1=Average outpatient expenditure per time; p_2=Average hospitalization expenditure per time; a=The number of population in each age group; r_1=Two-week consultation rate; r_2=One-year hospitalization rate.

Indirect economic burden

The indirect burden mainly consists of three components: the cost resulting from premature death; the cost resulting from short-term disability (such as quit school) and the cost resulting from long-term disability (such as mutilation). Indirect economic burden commonly used the methods of human capital approach or willingness to pay to convert lost life time (such as DALY) into money [14-16]. The formula of human capital calculation method is as follows:

Indirect economic burden$=DALY \times G \times W$

Where G=Per capita Gross Domestic Product (GDP); W=productivity weight. Different age groups had different productivity weights. According to Barnum's study [14], we defined the weights of productivity in the 0-14, 15- 44, 45-59, and more than 60 years old as 0.15, 0.75, 0.80 and 0.10, respectively. The average productivity weight of the total population was 0.5.

Results

Population and death

The 29.37 million population were monitored in Chongqing, 2013 (14.87 million males and 14.49 million females). The total mortality of cancer was 16.83/10,000, and the mortality for male (22.56/10,000) was higher than that for female (10.94/10,000) (χ^2=59902.01, P<0.0001). The mortality increased largely with age both in man and women (r=0.87, P=0.052) (Table 1).

Disease burden by age group and gender

The burden of cancers was at a very low level before the age of 30 and increased at accelerated speeds with age, then decreased at about 80 years old. The DALY loss per 1000 population was the highest in the 60-79 age group, and male had the heavier burden than female. The loss of YLL rate was much more than the loss of YLD rate, which meant that the burden of cancers was dominated by death rather than long-term disability (Figure 1).

Disease burden of major cancers by sex

The total burden of cancers was responsible for 24.26 DALYs per 1000 population in male (Table 2). Lung cancer and liver cancer had the highest share of total burden in male, which accounted for 54.93% of the total cancer burden, followed by esophagus cancer, stomach cancer, colorectal cancer and leukemia. The total burden of cancers was responsible for 12.83 DALYs per 1000 population in female (Table 3). The five leading causes of DALY in female were lung cancer, liver cancer, breast cancer, stomach cancer and colorectal cancer, respectively. The burden of lung cancer, liver cancer and breast cancer all accounted for more than 10% of the total cancer burden.

Table 1: The population (10,000) and mortality (/10,000) of cancer in 2013.

Age group	Male		Female		Total	
	Population	Mortality	Population	Mortality	Population	Mortality
0-4	81.21	0.48	71.95	0.32	153.16	0.40
5-14	171.41	0.46	152.91	0.33	324.32	0.40
15-29	302.00	1.01	300.56	0.71	602.56	0.86
30-44	325.76	6.58	326.8	3.52	652.56	5.05
45-59	345.41	23.92	342.39	10.32	687.81	17.15
60-69	157.97	61.28	144.93	26.30	302.9	44.54
70-79	77.67	109.15	77.09	50.43	154.76	79.90
80+	25.94	176.22	32.67	97.67	58.61	132.43
Total	1487.38	22.56	1449.31	10.94	2936.7	16.83

Table 2: The disease burden of main cancers for male (per thousand population) in 2013.

Cancers	YLL	YLL/ DALY (%)	YLD	YLD/ DALY (%)	DALY	DALY/Total DALY (%)
Lung cancer	7.22	96.58	0.26	3.42	7.48	30.83
Liver cancer	5.72	97.89	0.12	2.11	5.85	24.1
Esophageal cancer	1.94	96.84	0.06	3.16	2.00	8.26
Stomach cancer	1.74	95.6	0.08	4.40	1.82	7.51
Colorectal cancer	1.08	80.70	0.26	19.30	1.33	5.49
Leukemia	0.79	95.04	0.04	4.96	0.83	3.42
Nasopharyngeal carcinoma	0.29	93.04	0.02	6.96	0.31	1.28
Bladder cancer	0.17	70.45	0.07	29.55	0.24	1.01
Total cancer	21.9	90.28	2.36	9.72	24.26	100

Table 3: The burden of main cancers for female (per thousand population) in 2013.

Cancer	YLL	YLL/ DALY(%)	YLD	YLD/ DALY(%)	DALY	DALY/Total DALY (%)
Lung cancer	2.45	96.65	0.08	3.35	2.53	19.75
Liver cancer	1.57	97.79	0.04	2.21	1.61	12.54
Breast cancer	1.02	77.79	0.29	22.21	1.31	10.24
Stomach cancer	0.89	95.16	0.05	4.84	0.94	7.32
Colorectal cancer	0.69	79.33	0.18	20.67	0.87	6.81
Cervical cancer	0.57	73.81	0.2	26.19	0.77	6.02
Leukemia	0.59	95.26	0.03	4.74	0.62	4.85
Esophageal cancer	0.58	96.91	0.02	3.09	0.59	4.63
Nasopharyngeal carcinoma	0.12	91.35	0.01	8.65	0.13	0.99
Bladder cancer	0.04	77.63	0.01	22.37	0.05	0.38
Total cancer	10.95	85.34	1.88	14.66	12.83	100

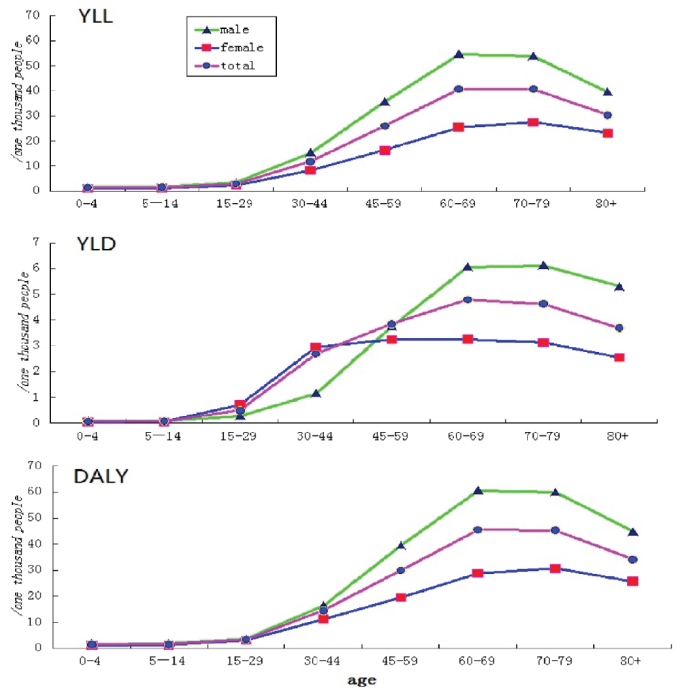

Figure 1: The cancer burden by age group and gender in 2013.

Apart from breast cancer and cervical cancer, male had the heavier burden than female in observed cancers, especially for lung cancer and liver cancer, in which male were 4.95 and 4.24 DALYs per 1000 population more than female, respectively. At the same time, esophagus cancer was the third cause of DALY in male (account for 8.26%), while the eighth in female (account for 4.63%). On the contrary, for some special cancers, female had the heavier burden than male. The burden of breast cancer attributed to more than 10% in female, whereas it was negligible in male. In addition, the distribution ratio of YLL in total DALYs was much higher than the YLD in all cancers both in female and male. The YLD contribution to DALYs in the case of male were all under 5% except for colon and rectal cancer (19.30%), bladder cancer (29.55%) and nasopharynx cancer (6.96%). In the case of female, the YLD contribution to DALYs was little higher than that in male, and a lot of cancers even had more than 20%, such as the breast cancer (22.21%), colon and rectal cancer (20.67%), cervical cancer (26.19%) and bladder cancer (22.37%).

Economic burden of major cancers

Data from the Fifth National Health Service Survey showed that average outpatient expenditure and average hospitalization expenditure based on all cases with a diagnosis of cancer were 718.96 CNY and 18212.88 CNY, respectively. Two-week consultation rate was 2.12%. One-year hospitalization rate was 3.04%. Based on the above indicators, the total economic burden could be calculated and the results showed that the burden was up to 14.787 billion CNY in Chongqing in 2013, accounted for 1.17% of GDP (Table 4). The top five cancers of economic burden were lung cancer, liver cancer, colorectal cancer, breast cancer and esophageal cancer. The direct economic burden was 2.822 billion CNY, accounting for 19.08% of the total economic burden, and was mainly attributable to breast cancer, colon and rectal cancer, nasopharynx cancer and lung cancer. The indirect economic burden was 11.965 billion CNY, accounting for 80.92% of the total economic burden, and was mainly attributable to lung cancer and liver cancer. The results indicated that the indirect economic burden was much higher than direct economic burden.

Table 4: The economic burden of main cancers (one hundred million CNY).

Cancers	Direct cost	Indirect cost	Total cost	Total cost/(%)	Total cost /GDP(%)
Lung cancer	2.44	32.15	34.59	23.39	0.27
Liver cancer	0.85	23.97	24.82	16.79	0.20
Colorectal cancer	6.30	7.06	13.36	9.04	0.11
Breast cancer	8.32	4.23	12.55	8.49	0.10
Esophageal cancer	2.39	8.35	10.73	7.26	0.08
Stomach cancer	0.14	8.85	8.99	6.08	0.07
Nasopharyngeal carcinoma	2.84	1.40	4.24	2.87	0.03
Cervical cancer	1.10	2.43	3.53	2.39	0.03
Total cancers	28.22	119.65	147.87	100.00	

Discussion

In the present study, cancer burden is comprehensively estimated both in economic and disease burden. DALY is a complex indicator that combines the components of premature death and disability [17,18]. Some parameters, such as age weight, disability weights, discount rate are introduced to comprehensively evaluate health status. The results showed that the total loss of DALY rate were 24.26 person years in male and 12.83 in female. Apart from breast cancer and cervical cancer, male had the heavier burden than female in observed cancers. Several risk factors can be taken into consideration, such as diet, alcohol, smoking and lifestyle [19-22]. Males are more likely to suffer from living and working stress, alcohol abuse, and addicting to nicotine, which could contribute to the high incidence for all kinds of cancer [23,24]. On the contrary, breast and cervical cancer bring heavy disease burden for female. Some studies reported that there was an increase of 14% in breast cancer deaths in recent 5 years all over the world [25]. The deaths of breast cancer were 522,000 in 2012 in the world, which made it the first cause of cancer death [26]. But there is a difference between developing and developed countries in mortality. Because of the lack of actions of early detection, mortality rates in developing countries are higher than that in developed countries.

Lung cancer and liver cancer take the most share of cancer burden in both male and female. Lung cancer had the highest mortality rate for six consecutive years in Chongqing. The mortality rate of lung cancer was 56.01/100,000 in 2013, accounting for 33.28% of total cancer deaths. The reasons may be attributed to some bad living habits and environmental pollution, such as smoking, long-term staying up late and air pollution [27]. What's more, smoking rate has been sustainable increasing in these years in Chongqing, while the screen of lung cancer in communities has not been established yet. For liver cancer, with 7000 cases per year [28], the incidence reached to 22.04/100,000 in 2013 in Chongqing. Several risk factors can be found, such as eating habits, living environment, and virus infection [29]. The screening rate of live cancer was also relatively low. In some giant companies and enterprises, a lot of people more than 45 years old are often advised to receive screening for tumor markers annually, which is necessary to help early diagnosis and treatment for cancer and may decrease the cancer mortality consequently. So people should cultivate good living habits such as quitting alcohol, keep exercising. For high-risk population, the early screening can significantly reduce the risk of cancer. For example, implementing the test of smear of cervix cells for female had sexual act. At the stage of primary prevention, enhancing the health education of cancer prevention, using medical supplies rationally, eliminating the occupational carcinogen, strengthening labor protection, environmental protection and food hygiene can prevent cancer effectively.

We found that the reason why the proportion of YLD is distinctly higher in bladder cancer, colon cancer, cervical cancer, and breast cancer,

as compared to lung cancer and pancreatic cancer is due to higher survival rates of patients with the former type of cancers, that is, the live longer with the disease. The proportion of YLD in DALY for cancer in Chongqing was similar to Korea [30], the burden of most diseases due to YLD were under 5% in men, except for bladder cancer and colon and rectal cancer. The reason may be that these cancers have lower mortalities compared to others. In the case of women, the burden due to disability was higher than that in men, especially for cervical cancer and breast cancer, of which the burden due to YLD was relatively higher compared to other cancers. This result might be explained by the severity of the cancers themselves, the low screening rate and the delayed diagnosis of cancers.

Our results indicated that large amounts of money were devoted to the treatment of cancers. The total economic burden of cancers was very large, up to 14.787 billion CNY, which had brought a heavy burden to individuals, families and society. We also found that different cancers show differing weights in direct and indirect costs. Because of the high morbidity, lung cancer and liver cancer took the most share of the economic burden, and their indirect economic burden caused by the loss of labor hours was significantly heavier than direct economic burden. Meanwhile, other cancers, such as colorectal cancer and breast cancer, took on a relatively high weighting in direct economic burden. The reason might be explained by the high rates of clinical visit and hospitalization, and the most of economic resources were expended in medical institutions [16].

This study has some limitations. In the first place, intangible economic burden was not taken into consideration, but some studies showed that it was necessary in the study of economic burden [31]. In the second place, some parameters, such as life expectancy, discount rate and age weight, were introduced into the study, which might be not necessarily suitable for Chongqing, and it could lead to deviation of the study results. However, using common parameters are conducive to the comparison of results among different regions.

Conclusions

Measures should be timely taken to prevent and control cancers, especially for lung cancer, liver cancer, breast cancer, colorectal cancer and esophagus cancer, which could bring a heavy economic and disease burden to the family and society. In a word, good life style and effective policies could reduce the burden.

Funding

This study was supported by the Foundation of *Chongqing Health and Family Planning Commission* (NO: 2013-2-157).

Acknowledgements

The authors would like to thank Chongqing Health Information Center staff and Professor Xiaoni Zhong, they provided the valuable data and some practical help.

Competing Interests

The authors declare that they have no competing interests.

References

1. Cao SM, Xu YJ, Lin GZ, Huang QH, Wei KR, et al. (2015) Estimation of cancer burden in Guangdong Province, China in 2009. Chin J Cancer 34: 594-601.
2. Hanly P, Soerjomataram I, Sharp L (2015) Measuring the societal burden of cancer: the cost of lost productivity due to premature cancer-related mortality in Europe. Int J Cancer 136: E136-E145.
3. Li R (2014) Cancer burden in China and the role of the cancer registries. Ann Transl Med 2: 69.
4. Dong H, Li H, Xu N, You W, Cheng S, et al. (2014) Strategies of developing translational research on cancer prevention and control in China. Zhonghua yi xue za zhi 94: 83-85.
5. Tan C, Peng L, Zeng X, Li J, Wan X, et al. (2013) Economic evaluation of first-line adjuvant chemotherapies for resectable gastric cancer patients in China. PLoS One 8: e83396.
6. Wvsocki MJ, Sakowska I, Car J (2005) Measures of burden of disease--new indicators of the health situation. Przegl Epidemiol 59: 125-134.
7. Daly BJ (2010) Introduction: interview with Barbara J. Daly, RN, PhD, FAAN, Gertrude Perkins Oliva Professor of Oncology Nursing, Case Western Reserve University, and Director, Clinical Ethics, University Hospitals Case Medical Center. Interviewed by Clareen Wiencek. AACN Adv Crit Care 21: 41-43.
8. Schopper D, Pereira J, Torres A, Cuende N, Alonso M, et al. (2000) Estimating the burden of disease in one Swiss canton: what do disability adjusted life years (DALY) tell us? Int J Epidemiol 29: 871-877.
9. Ma EB, Wang RT, Yang GH, Phillips MR (1999) Application of YLD calculation in assessing disease data--an analysis of 4 diseases in 2 regions. Biomed Environ Sci 12: 260-269.
10. Bonnie RJ FC, Liverman CT (1999) Reducing the burden of injury: advancing prevention and treatment. National Academy Press, Washington, DC, USA.
11. Kim SY, Park JH, Kang KH, Hwang I, Yang HK, et al. (2015) The economic burden of cancer in Korea in 2009. Asian Pac J Cancer Prev 16: 1295-1301.
12. Max W, Sung HY, Stark B (2009) The economic burden of breast cancer in California. Breast Cancer Res Treat 116: 201-207.
13. Salomon JA, Vos T, Hogan DR, Gagnon M, Naghavi M, et al. (2012) Common values in assessing health outcomes from disease and injury: disability weights measurement study for the Global Burden of Disease Study 2010. Lancet 380: 2129-2143.
14. Barnum H (1987) Evaluating healthy days of life gained from health projects. Soc Sci Med 24: 833-841.
15. Hyder AA, Morrow RH (2000) Applying burden of disease methods in developing countries: a case study from Pakistan. Am J Public Health 90: 1235-1240.
16. Akbari Sari A, Kazemi Karyani A, Alavian SM, Arab M, Rostami Gholmohamadi F, et al. (2015) The Economic Burden of Liver Cirrhosis in Iran: a Cost of Illness Study. Iran J Public Health 44: 512-521.
17. Dodhia H, Phillips K (2008) Measuring burden of disease in two inner London boroughs using Disability Adjusted Life Years. J Public Health (Oxf) 30: 313-321.
18. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, et al. (2012) Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 380: 2095-2128.
19. Harriss DJ, Atkinson G, George K, Cable NT, Reilly T, et al. (2009) Lifestyle factors and colorectal cancer risk (1): systematic review and meta-analysis of associations with body mass index. Colorectal Dis 11: 547-563.
20. Harriss DJ, Atkinson G, Batterham A, George K, Cable NT, et al. (2009) Lifestyle factors and colorectal cancer risk (2): a systematic review and meta-analysis of associations with leisure-time physical activity. Colorectal Dis 11: 689-701.
21. Guh DP, Zhang W, Bansback N, Amarsi Z, Birmingham CL, et al. (2009) The incidence of co-morbidities related to obesity and overweight: a systematic review and meta-analysis. BMC Public Health 9: 88.

22. Dai Z, Xu YC, Niu L (2007) Obesity and colorectal cancer risk: a meta-analysis of cohort studies. World J Gastroenterol 13: 4199-4206.

23. Weiderpass E, Margolis KL, Sandin S, Braaten T, Kumle M, et al. (2006) Prospective study of physical activity in different periods of life and the risk of ovarian cancer. International journal of cancer 118: 3153-3160.

24. Morris SC (1991) Trends in quantitative cancer risk assessment. Environmental health perspectives 90: 297-298.

25. Ginossar T, De Vargas F, Sanchez C, Oetzel J (2010) That word, cancer: breast care behavior of Hispanic women in new Mexico background and literature review. Health care for women international 31: 68-87.

26. Domínguez E, Santana F, Seuc AH (2014) Disability-adjusted life years for breast and reproductive system cancers in Cuban women of child bearing age. MEDICC Rev 16: 8-13.

27. Khan MM, Goto R, Kobayashi K, Suzumura S, Nagata Y, et al. (2004) Dietary habits and cancer mortality among middle aged and older Japanese living in hokkaido, Japan by cancer site and sex. Asian Pac J Cancer Prev 5: 58-65.

28. Wang R, Chen XZ, Zhang MG, Tang L, Wu H (2015) Incidence and mortality of liver cancer in mainland China: changes in first decade of 21st century. Hepatogastroenterology 62: 118-121.

29. Fan JH, Wang JB, Jiang Y, Xiang W, Liang H, et al. (2017) Attributable causes of liver cancer mortality and incidence in china. Asian Pac J Cancer Prev 14: 7251-7256.

30. Yoon SJ, Lee H, Shin Y, Kim YI, Kim CY, et al. (2002) Estimation of the burden of major cancers in Korea. J Korean Med Sci 17: 604-610.

31. Keating KN, Perfetto EM, Subedi P (2005) Economic burden of uncomplicated urinary tract infections: direct, indirect and intangible costs. Expert Rev Pharmacoecon Outcomes Res 5: 457-466.