

Article

Profile and trend of deaths from infectious and parasite diseases in Europe

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Received 20 January 2017; Accepted 10 February 2017; Published online 1 June 2017



Abstract

In present study, data of standardised death rates of infectious and parasite diseases per 100000 inhabitants in 31 European countries during 1994~2013 were used to analyze the profile and trend of deaths from infectious and parasite diseases. The results showed that averagely both the standardized (0.16/yr) and relative (0.0003/yr) death rates of infectious and parasite diseases in recorded European countries increased significantly during the recorded period 1994~2013. Luxembourg (1.11/yr) has the greatest annual growth in standardised death rate of infectious and parasite diseases, followed by Czech (0.82/yr), Sweden (0.75/yr), and Norway (0.72/yr). Luxembourg (0.0013/yr) has the greatest annual growth of relative death rate of infectious and parasite diseases vs. total diseases, followed by Sweden (0.0009/yr), and Norway (0.0009/yr), etc. During the period 1994~2013, Portugal (23.49) and Belgium (23.32) are the two countries with the greatest average of standardised death rates of infectious and parasite diseases in recorded European countries, while Slovakia (6.63) and Austria (6.75) are the smallest. According to above analysis of available data so far, infectious and parasite diseases are expected to be even more prevalent in the future, and more attention should be focused on these diseases in management of public health.

Keywords infectious and parasite diseases; environment; death rates; trend; Europe.

Environmental Skeptics and Critics

ISSN 2224-4263

URL: <http://www.iaees.org/publications/journals/environsc/online-version.asp>

RSS: <http://www.iaees.org/publications/journals/environsc/rss.xml>

E-mail: environsc@iaees.org

Editor-in-Chief: WenJun Zhang

Publisher: International Academy of Ecology and Environmental Sciences

1 Introduction

An infectious disease, also known as transmissible disease, is caused by the invading agents multiplying. These agents multiply, produce toxins and damage host tissues (Wikipedia, 2017a). There are a variety of infectious diseases, including Cholera, hepatitis a, polio, etc. Infectious diseases can be transmitted through various ways, e.g., unclean or contaminated drinking water / food / excrement, sexual and body contact, or other vectors. A parasite disease, also known as parasitosis, is an infectious disease caused or transmitted by a parasite (Wikipedia, 2017b). Human can get parasites from contaminated food or water, bug bites, or sexual

contact. For example, ingestion of contaminated water can produce Giardia infections. Globally there are 1.4 billion people are threaten by parasite diseases, particularly in Africa where health and environment conditions are poor. Malaria, myiasis, schistosomiasis, ascariasis, demodicosis, etc., are some important parasite diseases. Malaria is the most known parasite disease caused by mosquito. In an interview with the BBC, it is reported that in the UK each year about fifty hundreds people need to receive malaria treatment (Mao, 2017). In view of the certain environment properties of infectious and parasite diseases, in present study, I used the data of standardised death rates of infectious and parasite diseases and total diseases per 100000 inhabitants in 31 European countries during 1994~2013 to analyze profile and trend of deaths of infectious and parasite diseases in European countries, aiming to provide basic information for disease analysis and management.

2 Material and Methods

Data of standardised death rates of infectious and parasite diseases (x_1) and total diseases (y) per 100000 inhabitants in 31 European countries were collected from EUROSTAT (European Commission, 2017; http://ec.europa.eu/health/home_en). Data range was generally from 1994 to 2013 (in total of 20 years). Data for some countries or years were absent. Two indices, i.e., standardised death rates of infectious and parasite diseases, x_1 , and relative death rates of infectious and parasite diseases (x_1) vs. total diseases (y), $x_2 = x_1/y$, were chosen for further analysis.

Time series of above two indices (x_1 and x_2) were assumed to be a linear function of year. We use linear regression (Zhang, 2017a, 2017b) to fit the trends for each of the countries and indices: $x = a + b t$, where t is year, x is standardised or relative death rate at t , and b is the annual growth rate of standardised or relative death rate. Linear regressions were statistically tested with F -statistic, based on r^2 for the regression.

Simple statistics, e.g., average, percentage, etc., were also used to analyze the data.

3 Results and Analysis

3.1 Death levels of infectious and parasite diseases

During the full period (1994~2013), Portugal (23.49) and Belgium (23.32) are the two countries with the greatest average of standardised death rates of infectious and parasite diseases in recorded European countries, while Slovakia (6.63) and Austria (6.75) are the smallest (Table 1 and Fig. 1).

In the latest period (2009~2013), Belgium (25.04) and Luxembourg (24.96) are the two countries with the greatest average of standardised death rates of infectious and parasite diseases, and Macedonia (3.75) is the smallest (Table 1 and Fig. 1).

Table 1 Annual average of standardised death rates of infectious and parasite diseases per 100000 inhabitants for the full period 1994~2013 and the latest period 2009~2013.

Country	Austria	Belgium	Bulgaria	Croatia	Czech	Denmark	Estonia	Finland	France	Macedonia	Germany
Full period	6.75	23.32	8.85	10.14	7.68	14.77	11.67	9.03	18.79	8.22	15.57
Latest period	8.62	25.04	7.84	8.28	16.06	18.775	9.84	7.6	17.86	3.75	20
Country	Greece	Hungary	Iceland	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Norway
Full period	9.08	7.52	9.19	7.94	12.61	15.93	17.42	20.22	6.86	15.18	17.43
Latest period	10.04	7.8	6.3	8.24	16.64	13.88	18.56	24.96	5.66	17.18	23.1
Country	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	Switzerland	UK		
Full period	8.34	23.49	13.78	6.63	7.52	18.83	15.53	11.13	10.78		
Latest period	8.4	23.92	12.54	7.98	5.42	14.5	22.1	10.16	11.06		

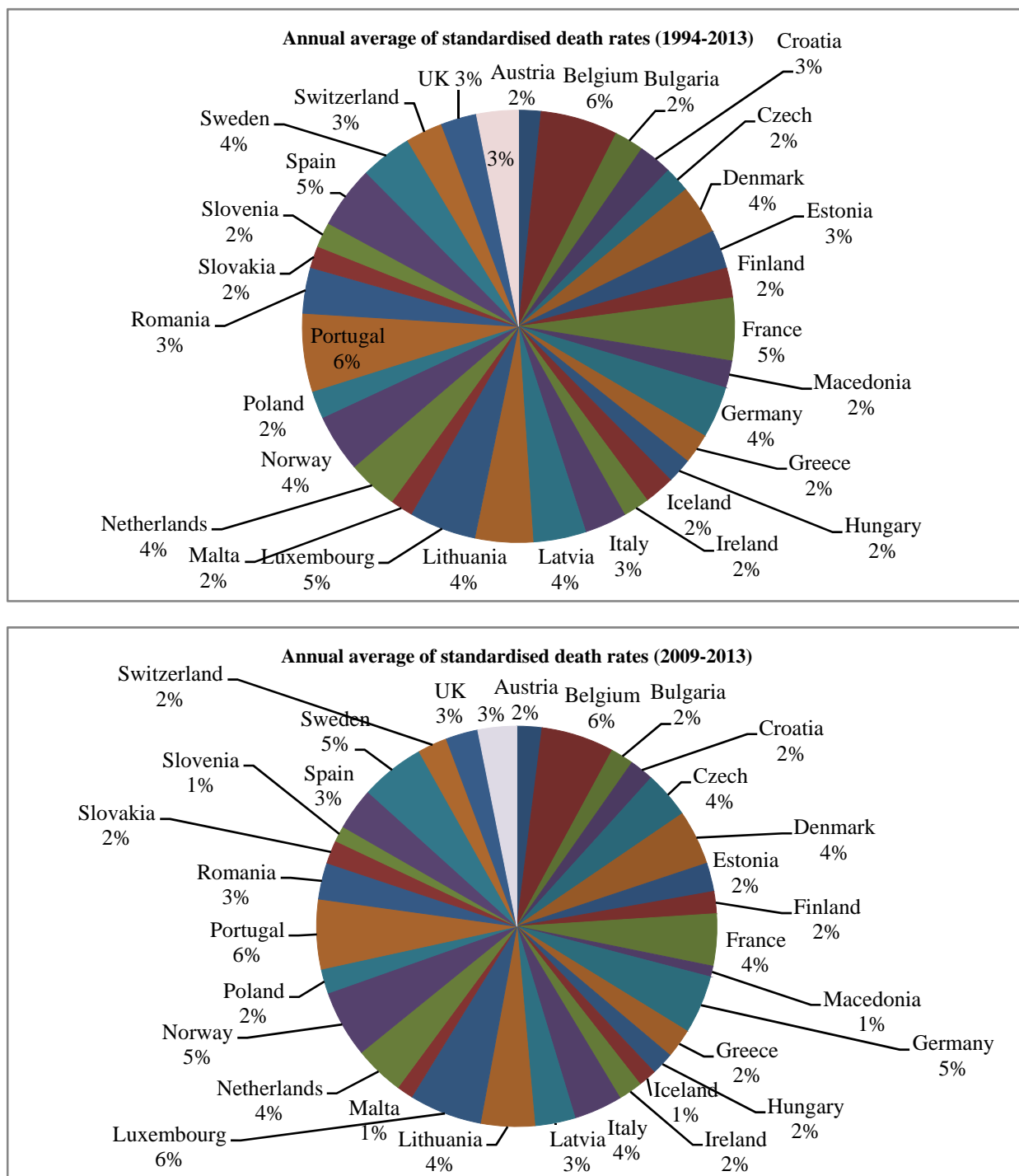


Fig. 1 Proportions of deaths of infectious and parasite diseases for 31 European countries for during the full period (1994~2013) and the latest period (2009~2013).

3.2 Trend of standardised and relative death rates of infectious and parasite diseases

In average, both the standardized (0.16/yr) and relative (0.0003/yr) death rates of infectious and parasite diseases in recorded European countries increased significantly ($b > 0$ and $p < 0.001$) during the recorded period 1994~2013 (Fig. 2 and Table 2).

3.2.1 Trend of standardised death rate

Luxembourg (1.11/yr) has the greatest annual growth in standardised death rate of infectious and parasite diseases, followed by Czech (0.82/yr), Sweden (0.75/yr), and Norway (0.72/yr) (Table 2).

Macedonia (-0.92/yr) is the country with greatest annual decline in standardised death rate of infectious and parasite diseases, followed by Croatia (-0.63/yr), Spain (-0.54/yr), and Latvia (-0.43/yr), etc.

The trend of Ireland, Slovenia, etc., is not clear.

3.2.2 Trend of relative death rate against total diseases

As for the relative death rate of infectious and parasite diseases vs. total diseases, Luxembourg (0.0013/yr) has the greatest annual growth of relative death rate of infectious and parasite diseases vs. total diseases, followed by Sweden (0.0009/yr), and Norway (0.0009/yr), etc.

Macedonia (-0.0005/yr) is the country with greatest annual decline in relative death rate, followed by Croatia (-0.0003), and Spain (-0.0002/yr), etc.

The trend of Hungary, Estonia, and Finland, etc., is not clear.

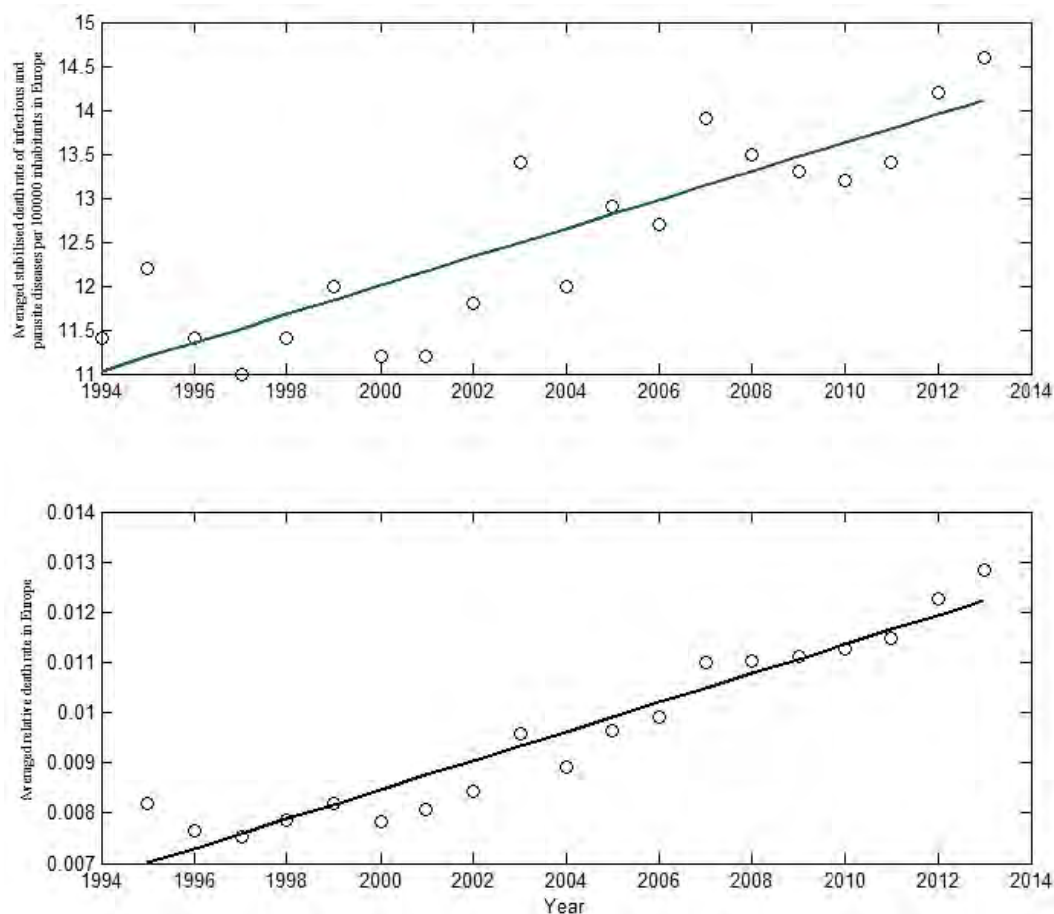


Fig. 2 Trend of averaged standardized (x_1) and relative (x_2) death rates of infectious and parasite diseases in recorded European countries.

4 Conclusions and Discussion

According to above analysis of available data so far, both the standardized and relative death rates of infectious and parasite diseases in recorded European countries increased significantly. Infectious and parasite diseases are expected to be even more prevalent in the future and more attention should be focused on these diseases in management of public health.

Table 2 Regression parameters for standardised death rates and relative death rates of infectious and parasite diseases per 100000 inhabitants in 31 European countries for the period 1994~2013.

	For standardized death rates				For relative death rates				
	<i>a</i>	<i>b</i>	<i>r</i> ²	<i>p</i>	<i>a</i>	<i>b</i>	<i>r</i> ²	<i>p</i>	
Macedonia	1851.516	-0.9196	0.9623	0	Macedonia	0.9536	-0.0005	0.9639	0
Croatia	1270.094	-0.6276	0.6907	0.0008	Croatia	0.557	-0.0003	0.5468	0.006
Spain	1107.047	-0.5432	0.7074	0	Spain	0.3901	-0.0002	0.2545	0.0233
Latvia	873.7876	-0.428	0.5564	0.0004	Poland	-0.1487	0.0001	0.3462	0.0102
Estonia	650.3798	-0.3188	0.6831	0	Ireland	-0.3421	0.0002	0.569	0.0001
Romania	622.7443	-0.3036	0.6729	0.0002	Greece	-0.4425	0.0002	0.5854	0.0001
France	612.0703	-0.2956	0.6249	0.0013	Slovakia	-0.4017	0.0002	0.5297	0.0006
Switzerland	592.8982	-0.2904	0.5355	0.0002	Lithuania	-0.3027	0.0002	0.4092	0.0024
Malta	419.1542	-0.2058	0.2087	0.0429	Austria	-0.6973	0.0004	0.8782	0
Finland	362.128	-0.1762	0.5493	0.0002	UK	-0.8401	0.0004	0.6111	0
Bulgaria	214.1695	-0.1025	0.3437	0.0083	Portugal	-1.0477	0.0005	0.7594	0
Greece	-216.432	0.1126	0.2356	0.03	Netherlands	-0.9136	0.0005	0.7905	0
Slovakia	-474.943	0.2402	0.4033	0.0046	Italy	-1.2249	0.0006	0.7615	0
Netherlands	-505.73	0.26	0.523	0.0003	Belgium	-1.3944	0.0007	0.7359	0
Austria	-552.578	0.2792	0.7552	0	Germany	-1.4044	0.0007	0.9707	0
UK	-586.052	0.2979	0.3755	0.0041	Denmark	-1.3216	0.0007	0.7886	0
Italy	-756.713	0.384	0.5393	0.0005	Czech	-1.3156	0.0007	0.7807	0
Belgium	-950.036	0.4857	0.4164	0.0051	Norway	-1.8394	0.0009	0.9514	0
Germany	-1100.67	0.5571	0.9572	0	Sweden	-1.7412	0.0009	0.9393	0
Denmark	-1139.6	0.5763	0.5893	0.0001	Luxembourg	-2.5494	0.0013	0.6858	0
Norway	-1432.18	0.7235	0.9321	0	France	-0.1887	0.0001	0.2944	0.0554
Sweden	-1495.68	0.7543	0.9421	0	Latvia	0.2132	-0.0001	0.1563	0.1044
Czech	-1625.1	0.815	0.7637	0	Iceland	-0.4199	0.0002	0.1401	0.1532
Luxembourg	-2206.53	1.1114	0.5598	0.0001	Slovenia	-0.1818	0.0001	0.0875	0.2055
Hungary	287.7087	-0.1398	0.1688	0.0719	Switzerland	0.1751	-0.0001	0.1037	0.1663
Portugal	-278.245	0.1506	0.122	0.1312	Bulgaria	-0.0421	0	0.1161	0.1535
Poland	90.0028	-0.0407	0.0802	0.2549	Romania	0.062	0	0.0619	0.3714
Lithuania	-127.495	0.0723	0.0646	0.2794	Malta	0.0943	0	0.0174	0.5793
Iceland	-169.182	0.0891	0.0244	0.5637	Finland	0.0262	0	0.0036	0.8023
Slovenia	59.0386	-0.0257	0.0043	0.7834	Estonia	0.0192	0	0.0019	0.8549
Ireland	27.5231	-0.0098	0.003	0.8186	Hungary	-0.0114	0	0.0017	0.8613
Average	-312.996	0.1625	0.7463	0	Average	-0.5721	0.0003	0.9186	0

Green: countries with significantly declined death rate; Red: countries with significantly increased death rate; Black: countries without significantly both declined and increased death rate.

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