



ORIGINAL RESEARCH

Health of the Slovenian population: Where do we stand?

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Abstract

Aim: Aiming at assessing the state of the Slovenian population health according to the latest available data, and comparing it with health in selected countries, the objective was to analyse the burden of disease (BoD) data available in a selected database.

Methods: The Institute for Health Metrics and Evaluation Global Burden of Disease Study (IHME-GBD) database was used. Causes of all three big IHME-GBD groups: A) communicable, maternal/neonatal conditions, and nutritional deficiencies, B) non-communicable diseases, and C) injuries, in total 18 groups of causes, were observed. Overall mortality, Disability Adjusted Life Years (DALYs), Years of Life Lost (YLLs) and Years Lived with Disability (YLDs) (all per 100.000 population), were used as indicators. Percentage of BoD generated by selected cause, and the ratios of rates in 2019 versus rates in 2014 (reference year) in Slovenia, and the ratios of rates in Slovenia versus rates in Western Europe Region countries (WERC) were analysed. Ratios >1.20 or <0.83 were considered as important.

Results: When considering mortality, the greatest burden was generated by cardiovascular diseases and neoplasms. In maternal/neonatal conditions, an important decrease in overall (0.68) and premature (0.68) mortality, while in nutritional deficiencies an increase in overall mortality (1.27) were observed. An increase in overall mortality was noticed also in neurological disorders (1.21), diabetes (1.21) and skin diseases (1.24). Mortality rates were higher in Slovenia than in WERC in digestive diseases, substance use, unintentional injuries and self-harm. When considering disability, the greatest burden was generated by musculoskeletal and mental disorders, and unintentional injuries. Disability rates were higher in Slovenia than in WERC in maternal/neonatal conditions, and unintentional and transport injuries.

Conclusion: In the observed five-year time span, cardiovascular diseases and neoplasms remained at the forefront. However, their burden didn't change. Causes with burden expressed by disability, musculoskeletal and mental disorders, and unintentional injuries, which has been neglected in the past due to lack of indicators, proved to be an important problem as well. MPHPs in which a lot has to be done to reach rates in WERC, digestive diseases, substance use, and injuries, were identified.

Keywords: *burden of disease, mortality, disability, Slovenia, South East Europe*

Conflict of interest statement

The authors declare no conflict of interest.

Introduction

Good governance for health is closely related to health data, so that decision-makers can set meaningful and evidence-based priorities and decide which needs to be addressed first. Among them major public health problems (MPHPs) are mainly at the forefront.

According to Bojan Pirc, a Slovenian health statistician and the World Health Organization (WHO) expert (1), criteria for classifying an individual health problem as MPHP are 1) it is widespread/could be rapidly spread (measured by prevalence/incidence), 2) social factors greatly influence its onset/course, 3) significantly causes disability/reduces the work ability/impairs daily activities, 4) generates large direct or indirect costs, 5) affects the quantity/quality of offspring, 6) increases mortality, especially in the productive ages (measured by mortality), along with the most important criterion - 7) it can be tackled by public health measures (2). In the past, the criteria of prevalence, incidence and especially mortality were considered as most prominent.

However, since introduction of Disability Adjusted Life Years (DALYs) indicator and its components (Years of Life Lost – YLLs, and Years Lived with Disability - YLDs) in the first Global Burden of Disease (GBD) study in the early 90s, the criteria of disability became equally important as incidence, prevalence and mortality (3,4). These indicators have made it possible to quantify burden of disease (BoD) in diseases whose consequences are mainly expressed in disability and which has been neglected in the past due to the lack of appropriate indicators. BoD data for European countries are available in several databases, including WHO, Regional Office for Europe, Health for All Database (5), Organisation for Economic Co-operation and Development (OECD) database (6), Statistical Office of the European Union (EU) EUROSTAT database (7), and the Institute for Health Metrics and Evaluation (IHME), University of Washington, GBD Study (IHME-GBD) database (8).

Slovenia is one of the countries, positioned in the central and south-eastern (SEE) European regions that actively cooperate in numerous joint projects in the field of public health. From projects with important German support, a network Forum for Public Health in SEE has emerged (9), whose one of the most significant successes was the founding of the SEE Journal of Public Health (SEEJPH) in 2014.

At the initiative of SEEJPH to prepare a special volume on the changes in the field of public health in the SEE countries after SEEJPH foundation, the main aim of this study was to show the Slovenian population BoD according to the latest available data, and potential changes in the given time-frame. Secondary aim was to find useful presentation to show which diseases cause the greatest BoD, considering different types of burden. The objectives set were to analyse the latest BoD data available for Slovenia in one of the databases offering global health statistics, as well as to compare it to the health data of selected regions.

Methods

Study design, data source and period of observation

The study was descriptive observational on a populational level. IHME-GBD database was selected as data source (8). The changes in the Slovenian BoD were observed between 2014 and 2019 (the last update). When presenting the Slovenia BoD in comparison to the health of populations of selected regions, only the last update data were chosen.

Populations for comparison

In the IHME-GBD database, the region mostly overlapping with the SEE region, was the Central Europe Region (CERC) (8): Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Montenegro, North Macedonia, Poland, Romania, Serbia, Slovakia and Slovenia.

Both, population of Slovenia and CERC were compared to the population of Western Europe Region countries (WERC) (Andorra, Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom) (8), chosen as the reference population.

Observed indicators

The following indicators were observed (as rates): (8). overall mortality (deaths per 100.000 population), DALYs (DALYs per 100.000 population), and both components of the later - years of life lost due to premature mortality (YLLs) (YLLs per 100.000 population) and years lived with disability (YLDs) (YLDs per 100.000 population)

Observed BoD causes

In the IHME-GBD database, BoD causes are arranged at the basic level (level 1) in 3 large groups – Group A: Communicable, maternal/neonatal conditions, and nutritional deficiencies, Group B: Non-communicable diseases, and Group C: Injuries. Level 1 is followed by three more levels (8). The causes of all three basic groups were observed.

Methods of analysis

First, the Slovenia BoD in 2019 for all observed indicators in terms of a percentage of total burden was observed for all groups of causes at level 2. For the purpose of the study, some groups were rearranged, considering the breakdown of level 2 causes at the level 3. In Group A consequently communicable diseases (all communicable diseases grouped into one group), maternal/neonatal disorders, and nutritional deficiencies were observed, in Group B neoplasms, cardiovascular diseases, chronic respiratory diseases, digestive diseases, neurological disorders, mental disorders, substance use disorders, diabetes,

skin and subcutaneous diseases, sense organ diseases, musculoskeletal disorders, and other non-communicable diseases (including kidney diseases), and in Group C transport injuries, unintentional injuries, and self-harm and interpersonal violence were observed. Altogether 18 groups of causes were considered, i.e. three from Group A, 12 from Group B and three from Group C. Polar plots, circular charts consisting of a sequence of lines starting at the centre and spaced at equal angles to each other, each line representing one of the variables (10), were used for visualization. In continuation, within each of the BoD indicators, the groups of causes were ranked according to the indicator value. The ranks were summed and the groups of causes were reranked according to the value of the sum of the ranks. The lower the sum the higher overall burden of each group of causes. In the end, the final ranking was adjusted according to the number of lower ranks achieved within each burden indicator.

Afterwards, the relative change in overall mortality, DALYs, YLLs and YLDs rates within each group of causes in Slovenia between 2014 and 2019, measured by four different indicators, was observed (2014 was chosen as the reference year), followed by estimating the rates in Slovenia versus rates in WERC ratios in 2019. The estimates of rates in CERC versus rates in WERC ratios was observed as well. Ratios >1.20 or <0.83 were considered important (increase – slight: 1.21-1.40; moderate: 1.41-1.60; considerable: 1.61-2.00; extreme: >2.00 ; decrease – slight: 0.82-0.71; moderate: 0.70-0.63; considerable: 0.62-0.50; extreme: <0.50). A group of causes Other non-communicable diseases was excluded from this analysis. In supplementary material the same analysis was performed within selected level 3 causes (Supplementary 1-3). Again, polar plots were used for visualization. All diagrams were prepared in Microsoft Excel, license University of Ljubljana.

The consent of the ethics committee was not required as the study was performed only on aggregated publicly available data.

Results

Percentage of BoD generated by selected groups of BoD causes

Figure 1 shows a percentage of total Slovenia BoD in 2019, generated by selected groups of causes, measured by overall mortality, DALYs, YLLs and YLDs, while Table 1 shows ranking of causes within overall mortality, DALYs, YLLs and YLDs, sum of ranks, and overall ranking. If considering only mortality, by far the greatest burden was generated by cardiovascular diseases and neoplasms (sharing the 1st and 2nd place generate about 3.8-5.5-times greater burden than the 3rd and 4th ranked neurological disorders and digestive diseases) (Figures 1a and 1c, Table 1). However, when disability was considered, the picture changed (Figure 1b and 1d), especially when only disability was considered (Figure 1d).

More detailed results showed that the Group B causes generated about 79.1-89.7% of the total Slovenia BoD. The greatest burden was generated by cardiovascular diseases and neoplasms, in both greatest in terms of mortality (cardiovascular diseases 29.3-37.5% and neoplasms 30.4-36.2%). On the other hand, musculoskeletal and mental disorders, and sense organ and skin/subcutaneous diseases generated none or almost none (mostly far below 1%) burden in terms of mortality, while the contribution of burden in terms of YLDs was substantial in musculoskeletal (15.6%) and mental disorders (12.3%) (Figure 1). The Group C causes proved to be a significantly smaller BoD generator, generating about 6.7-17.0% of the total Slovenia BoD, the greatest in terms of YLDs. Within the group, the greatest burden was generated by unintentional injuries, greatest in terms of disability isolated (13.4%) (Figure 1). On the other hand, transport injuries generated very low (0.8%) burden in terms of overall mortality, and self-harm and

interpersonal violence injuries very low (0.6%) burden in terms of YLDs. The weakest BoD generator was Group A causes, generating only about 3.0-3.9% of the total Slovenia BoD. The greatest burden was generated by communicable diseases, greatest in terms of mortality (2.6-3.5%) (Figure 1). The other two subgroups generated burden lower than 1% in all indicators except in YLDs in maternal/neonatal conditions (1.3%).

Ratios of rates in 2019 versus rates in 2014 in Slovenia, and the ratios of rates in Slovenia and rates in CERC versus rates in WERC

Group A causes

Figure 2 shows the ratios of rates in Slovenia in 2019 versus 2014 (Figure 2, left diagrams), and the ratios of rates in Slovenia and CERC versus rates in WERC (Figure 2, right diagrams) in the Group A causes.

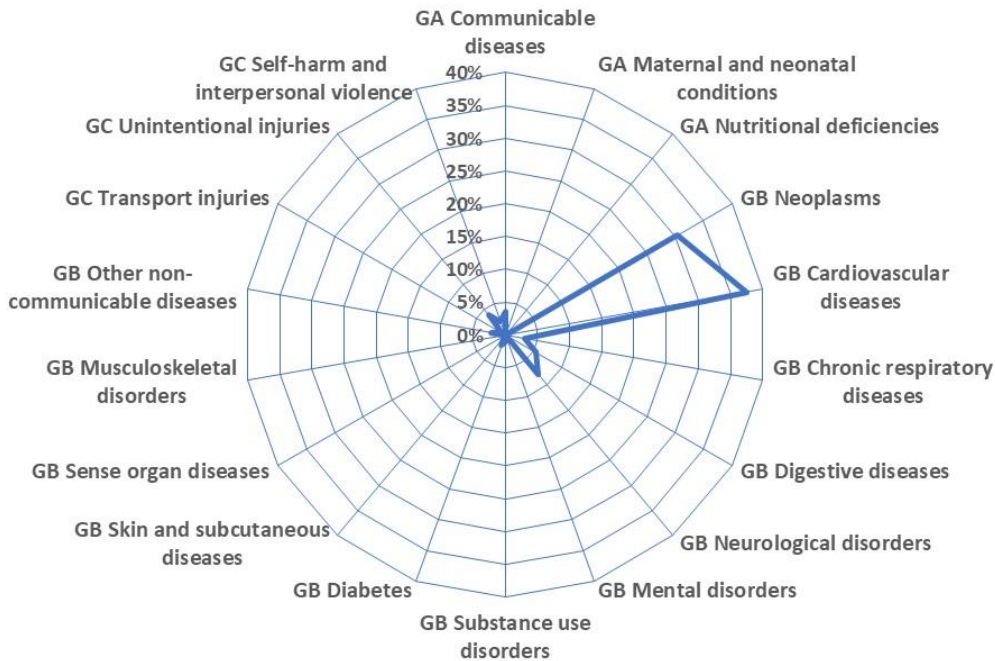
Important ratios of rates in Slovenia in 2019 versus 2014 were noticed in maternal/neonatal conditions (overall mortality: 0.68, YLLs: 0.68), and in nutritional deficiencies (overall mortality; 1.27) (Figure 2). When comparing Slovenia to WERC, important ratios of rates in Slovenia versus rates in WERC were noticed in all Group A causes (communicable diseases - overall mortality: 0.82, YLLs: 0.81; maternal/neonatal conditions - overall mortality: 0.52, YLLs: 0.52, YLDs: 1.35; nutritional deficiencies - overall mortality: 0.04, DALYs: 0.74, YLLs: 0.07, YLDs: 0.82) (Figure 2).

The comparison of CERC to WERC on more aggregated level suggests that in communicable diseases (except in YLDs) Slovenia and both European regions BoDs were relatively similar. In nutritional deficiencies the Slovenia BoD was more similar to CERC (in both the mortality burden is significantly lower than in WERC), while in maternal/neonatal conditions, the mortality burden was significantly lower in Slovenia than in WERC and CERC, however, the rate of YLDs was higher in Slovenia than in WERC (Figure 2).

Figure 1. Percentage of total burden of diseases in Slovenia in 2019.

LEGEND: GA=Group A causes (Communicable diseases, maternal and neonatal conditions and nutritional deficiencies); GB=Group B causes (Non-communicable diseases); GC=Group C causes (Injuries); Deaths=overall mortality; DALYs=Disability Adjusted Life Years; YLLs=Years of Life Lost; YLDs=Years Lived with Disability.

a) Deaths



b) DALYs

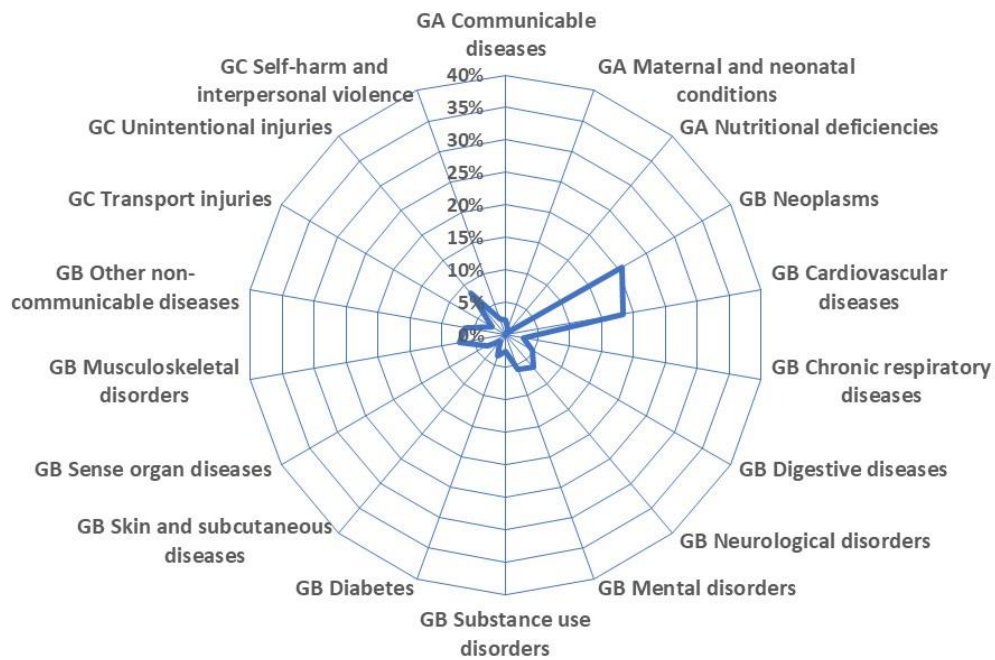
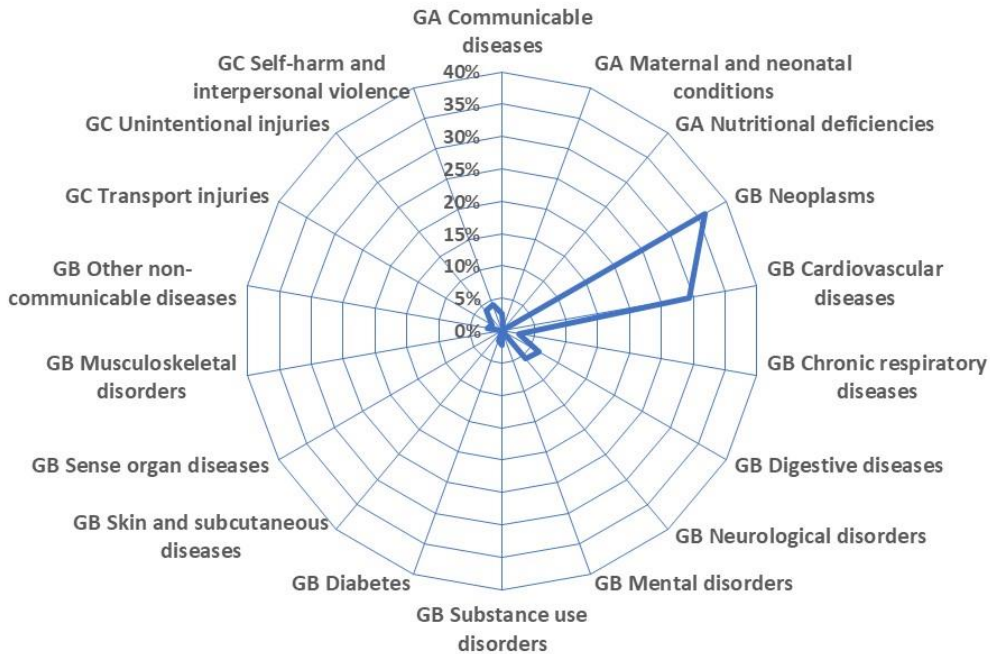
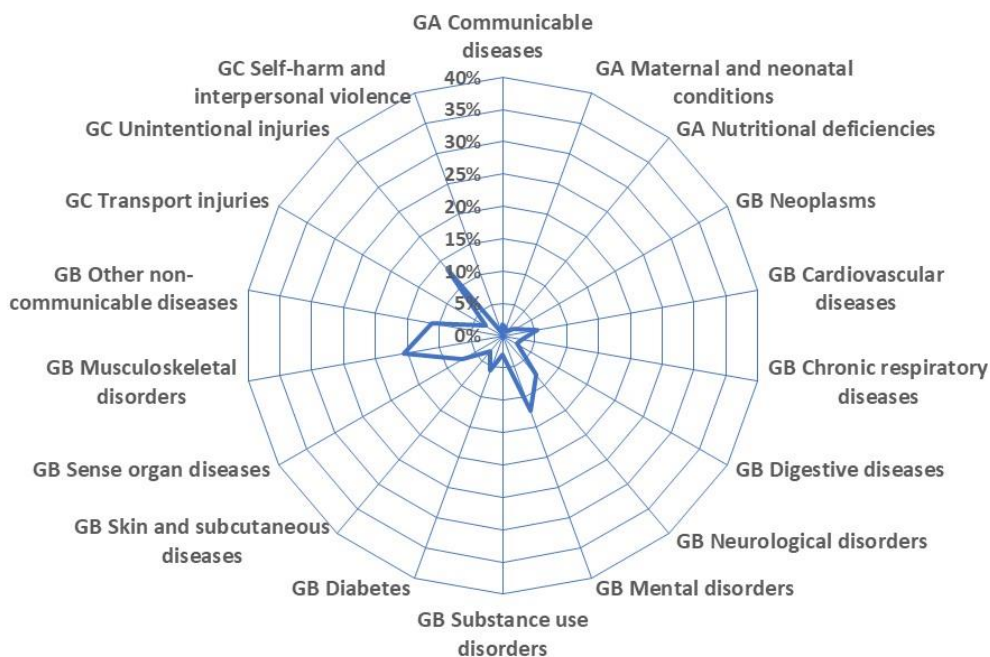


Figure 1. Continuation

c) YLLs



d) YLDs



Presentation of BoD in more disaggregated cause groups is available in Supplementary 1, where considerable reduction in HIV/sexually transmitted diseases mortality rates in Slovenia between 2014 and 2019 can be observed. In

this group the Slovenia BoD was also much lower than in WERC as well as in CERC. The BoD of the entire maternal/neonatal conditions group was primarily at the expense of neonatal conditions.

Table 1. Ranks of groups of causes within overall mortality, DALYs, YLLs and YLDs, sum of ranks, and overall ranking of causes in Slovenia in 2019.

Group of causes	Rank within				Sum of ranks	Adjusted overall rank
	Deaths	DALYs	YLLs	YLDs		
GB Cardiovascular diseases	1	2	2	8	13	1
GB Neoplasms	2	1	1	14	18	2
GC Unintentional injuries	5	3	6	2	16	3
GB Neurological disorders	3	5	4	5	17	4
GB Digestive diseases	4	8	3	13	28	5
GB Musculoskeletal disorders	13	4	14	1	32	6
GB Mental disorders	17	7	17	3	44	7
GB Other non-communicable diseases	8	6	9	4	27	8
GA Communicable diseases	6	15	7	15	43	9
GB Chronic respiratory diseases	7	11	8	9	35	10
GB Diabetes	10	9	12	7	38	11
GC Self-harm and interpersonal violence	9	12	5	18	44	12
GB Sense organ diseases	18	10	18	6	52	13
GB Substance use disorders	11	13	10	12	46	14
GC Transport injuries	12	14	11	11	48	15
GB Skin and subcutaneous diseases	15	16	15	10	56	16
GA Maternal and neonatal conditions	14	17	13	16	60	17
GA Nutritional deficiencies	16	18	16	17	67	18

LEGEND: GA=Group A causes (Communicable, maternal, neonatal, and nutritional diseases); GB=Group B causes (Non-communicable diseases); GC=Group C causes (Injuries); Deaths=overall mortality; DALYs=Disability Adjusted Life Years; YLLs=Years of Life Lost; YLDs=Years Lived with Disability; Burden of Disease scale: ■=very high, ■=high, ■=moderate, ■=low, ■=very low

Group B causes

Figure 3 shows the ratios of rates in Slovenia in 2019 versus 2014 (Figure 3, left diagrams), and the ratios of rates in Slovenia and CERC versus rates in WERC (Figure 3, right diagrams) in the Group B causes.

No greater changes in rates in Slovenia in 2019 versus 2014 were observed in any of the non-communicable disease groups. Only in neurological disorders, diabetes and skin diseases an increase in rates slightly above the set limit of importance in terms of overall mortality was noticed (neurological disorders: 1.21; diabetes: 1.21; skin diseases: 1.24) (Figure 3).

When comparing Slovenia to WERC, important ratios of rates in Slovenia versus rates in WERC were noticed in all subgroups

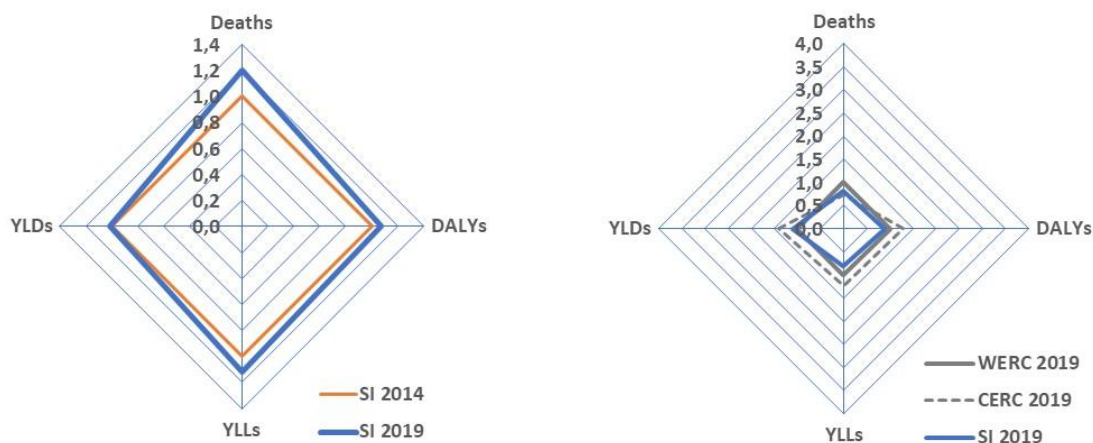
of causes, except in neoplasms and neurological disorders (cardiovascular diseases – YLDs: 1.32; digestive diseases – DALYs: 1.33, YLLs: 1.36, YLDs: 1.25; musculoskeletal disorders - overall mortality: 0.70, DALYs: 0.74, YLDs: 0.74; mental disorders – overall mortality: 0.02, DALYs: 0.78, YLLs: 0.02, YLDs: 0.78; chronic respiratory diseases – overall mortality: 0.55, DALYs: 0.63, YLLs: 0.57, YLDs: 0.70; diabetes - overall mortality: 0.78; sense organ diseases - DALYs: 1.27, YLDs: 1.27; substance use disorders - overall mortality: 1.86, DALYs: 1.22, YLLs: 1.65; skin and subcutaneous diseases - overall mortality: 0.25, DALYs: 0.58; YLLs: 0.30, YLDs: 0.59) (Figure 3).

Figure 2. The ratios of rates in Slovenia in 2019 versus rates in 2014 (left diagrams), and the ratios of rates in Slovenia and rates in CERC versus rates in WERC (right diagrams) within group of communicable diseases, maternal and neonatal conditions, and nutritional deficiencies.

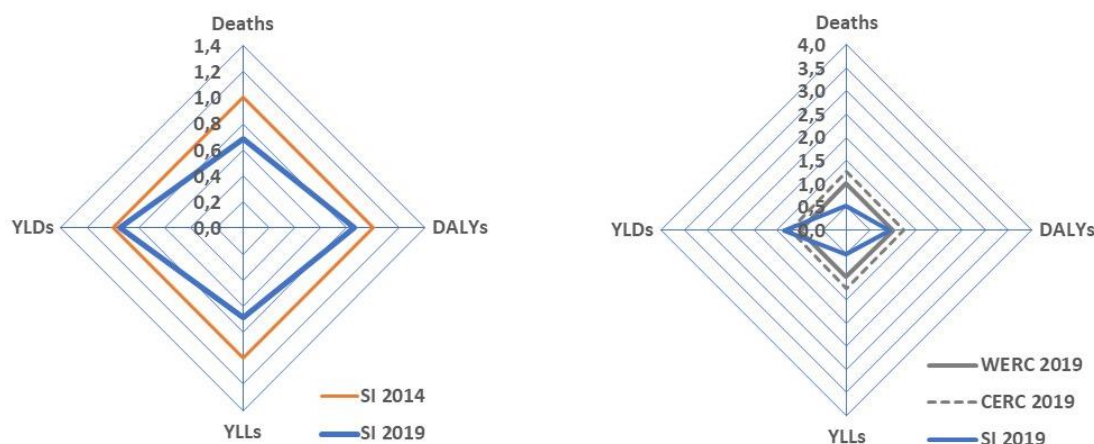
LEGEND: Deaths=overall mortality; DALYs=Disability Adjusted Life Years; YLLs=Years of Life Lost; YLDs=Years Lived with Disability – all per 100.000 population; WERC=Western Europe Region countries; CERC=Central Europe Region countries.

COMMUNICABLE DISEASES, MATERNAL AND NEONATAL CONDITIONS & NUTRITIONAL DEFICIENCIES

a) Communicable diseases



b) Maternal and neonatal conditions



c) Nutritional deficiencies

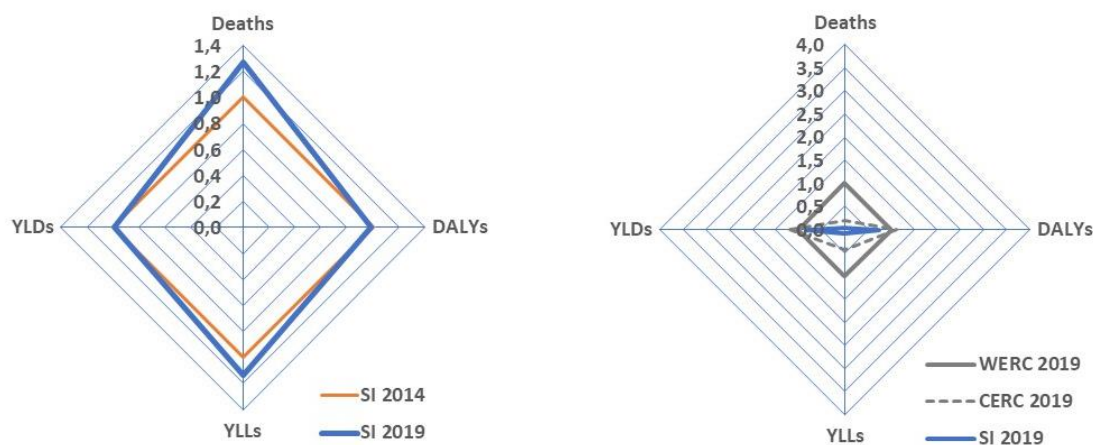
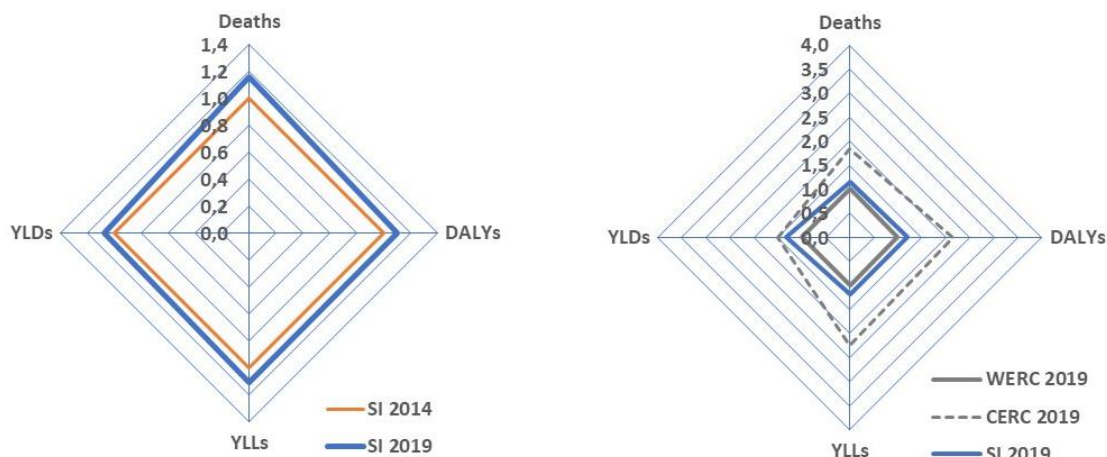


Figure 3. The ratios of rates in Slovenia in 2019 versus rates in 2014 (left diagrams), and the ratios of rates in Slovenia and rates in CERC versus rates in WERC (right diagrams) within group of non-communicable diseases.

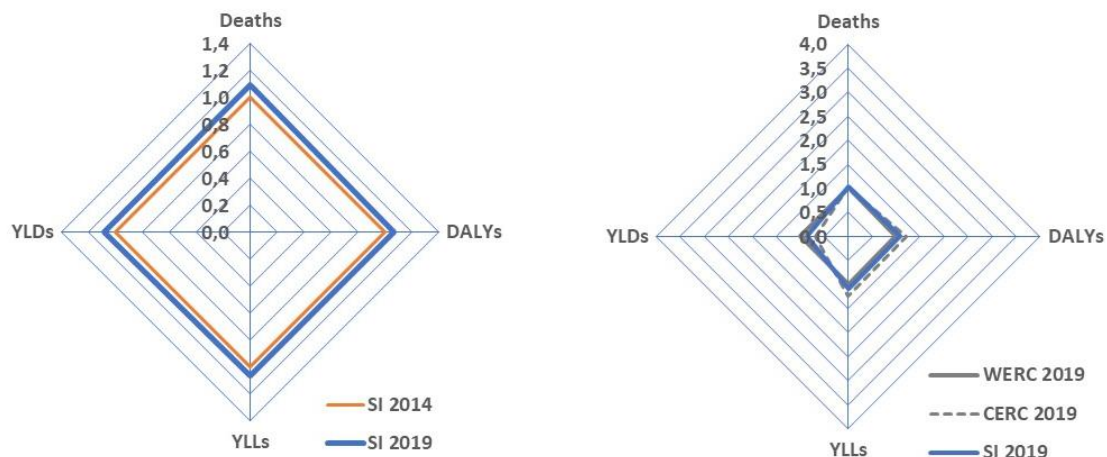
LEGEND: Deaths=overall mortality; DALYs=Disability Adjusted Life Years; YLLs=Years of Life Lost; YLDs=Years Lived with Disability – all per 100.000 population; WERC=Western Europe Region countries; CERC=Central Europe Region countries.

NON-COMMUNICABLE DISEASES

a) Cardiovascular diseases



b) Neoplasms



c) Neurological disorders

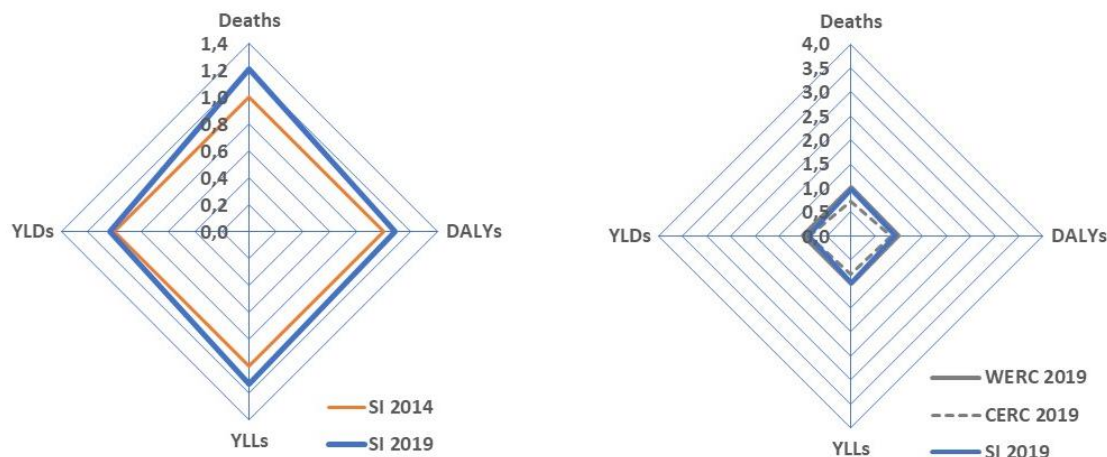
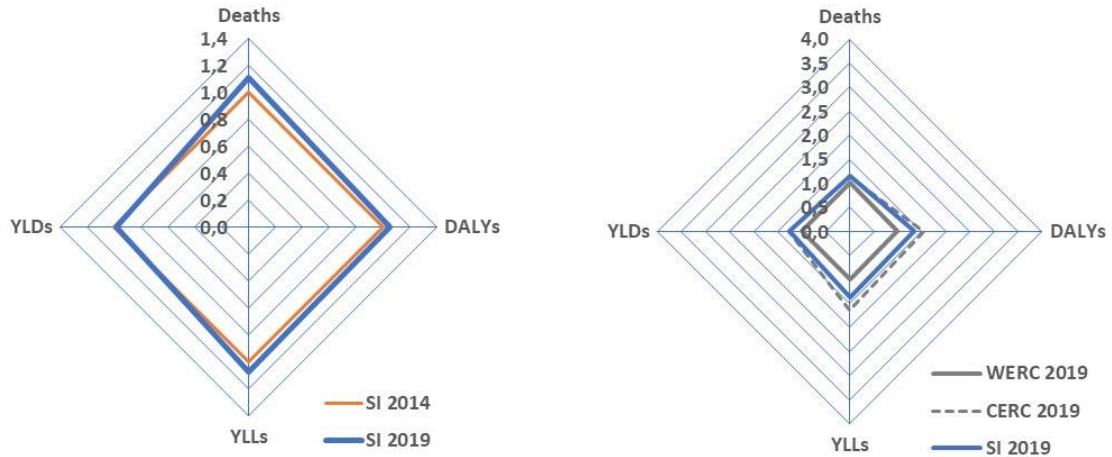
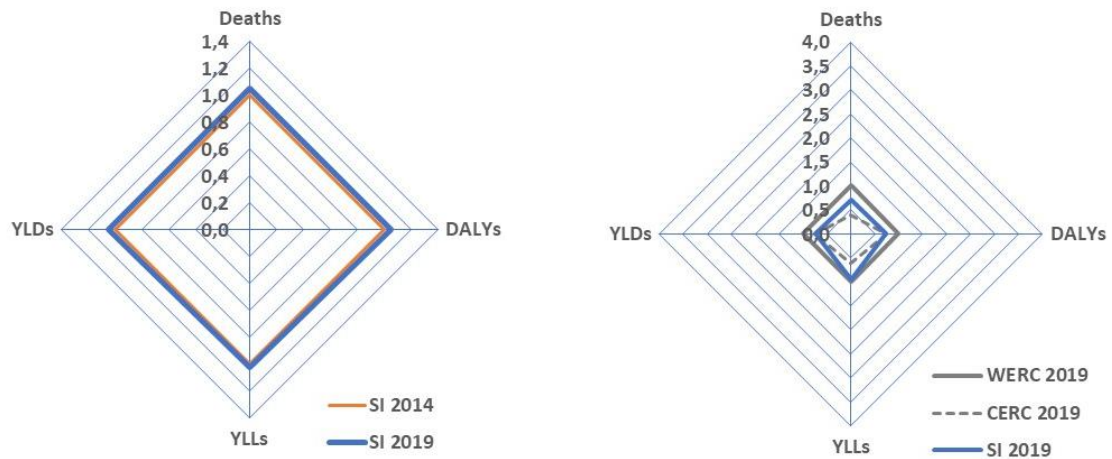


Figure 3. Continuation

d) Digestive diseases



e) Musculoskeletal disorders



f) Mental disorders

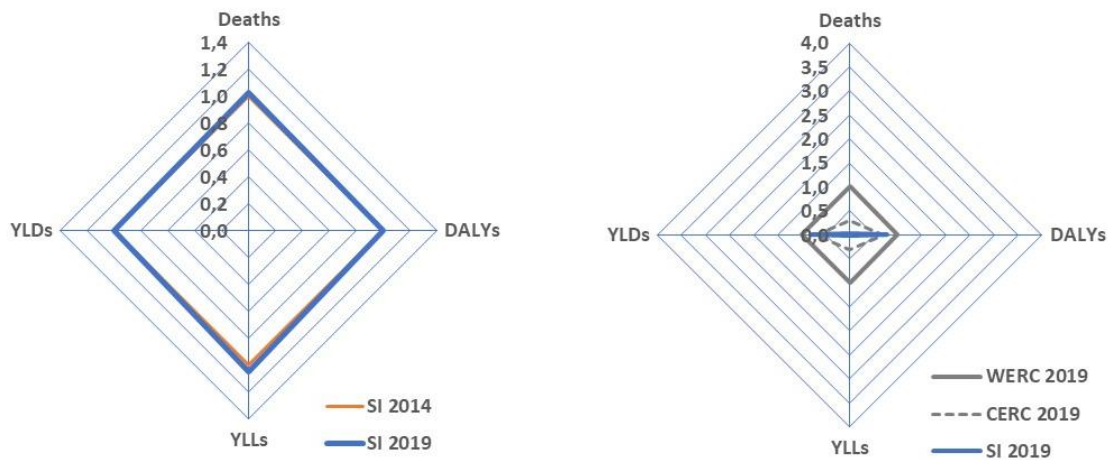
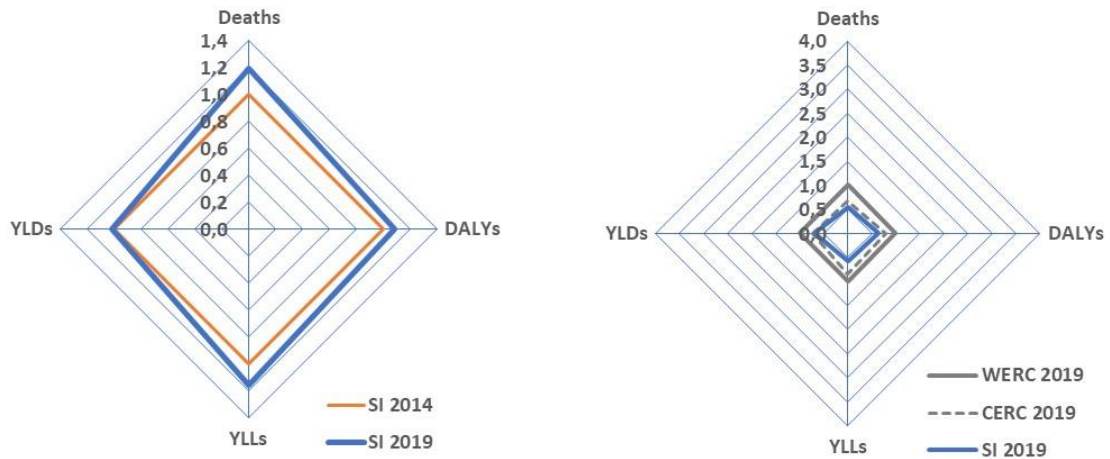
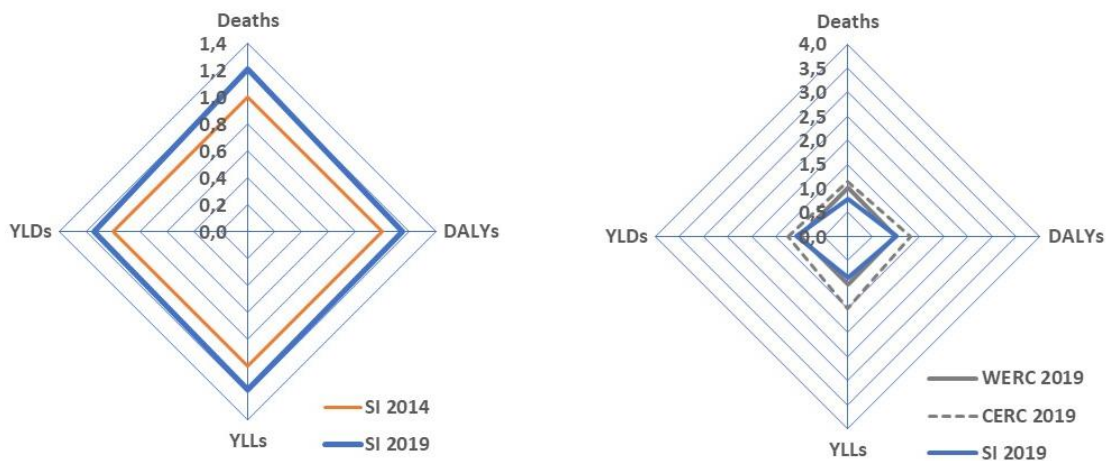


Figure 3. Continuation

g) Chronic respiratory diseases



h) Diabetes



i) Sense organ diseases

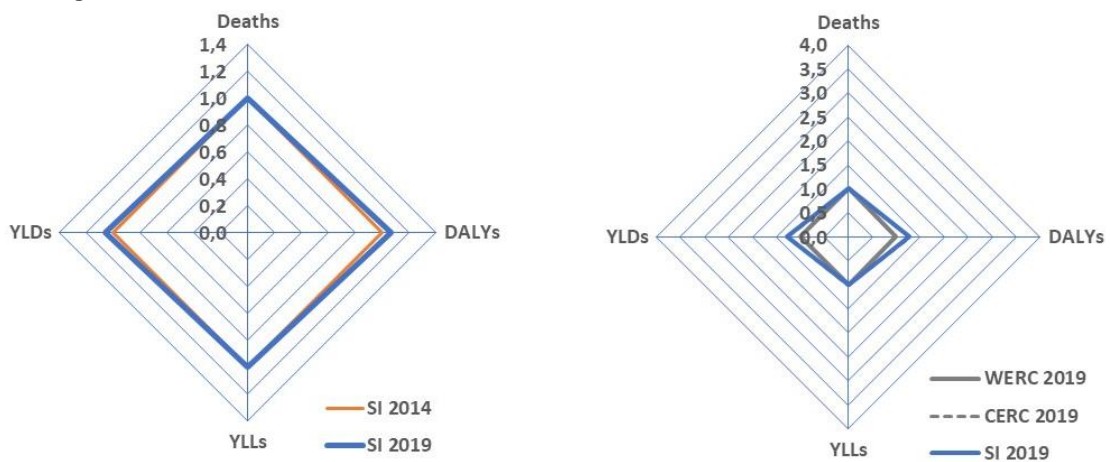
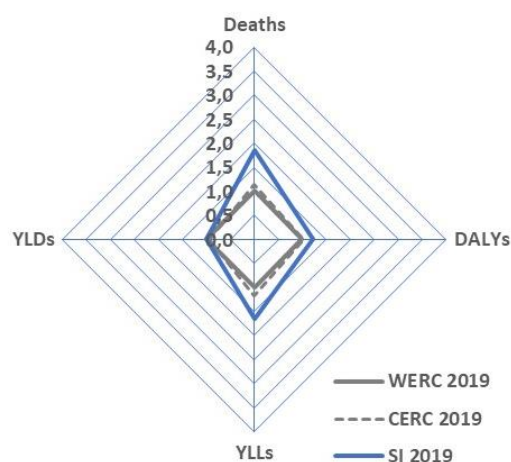
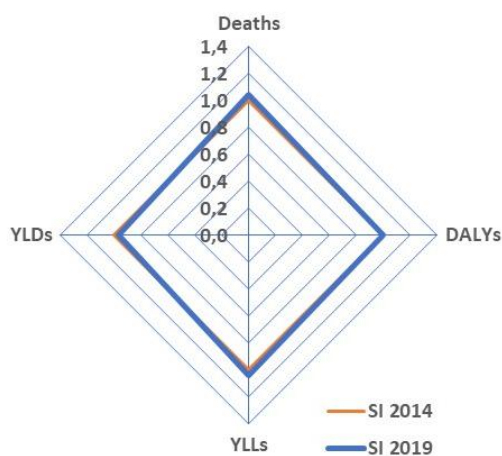
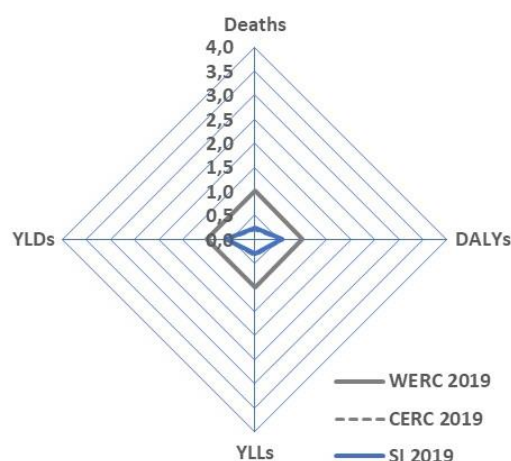
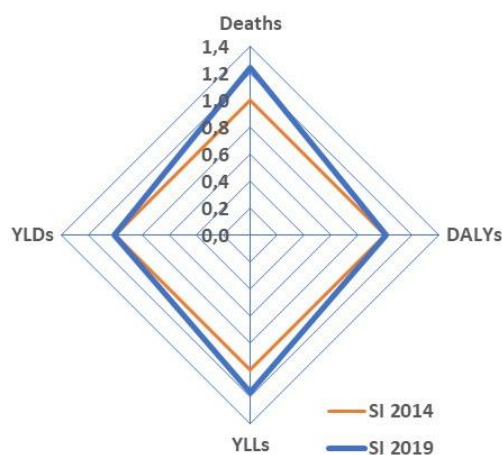


Figure 3. Continuation

j) Substance use



k) Skin and subcutaneous diseases



The comparison of CERC to WERC on more aggregated level suggests that in neoplasms (except in YLDs), neurological disorders, diabetes (except in YLLs) and sense organ diseases the Slovenia and both European regions rates were more or less similar. In musculoskeletal and mental disorders, chronic respiratory diseases and skin/subcutaneous diseases the rates were mainly much lower in Slovenia and CERC than in WERC, in cardiovascular diseases much higher in CERC than in Slovenia and WERC, while in digestive diseases mainly much higher in CERC than in WERC and Slovenia, and in substance use disorders mainly much higher in Slovenia than in CERC and WERC (Figure 3).

Presentation of BoD in more disaggregated groups of causes is available in Supplementary 2, where much higher BoD in selected cardiovascular diseases and alcohol use disorders in Slovenia than in WERC can be observed.

Group C causes

Figure 4 shows the ratios of rates in Slovenia in 2019 versus 2014 (Figure 4, left diagrams), and the ratios of rates in Slovenia and CERC versus rates in WERC (Figure 4, right diagrams) in the Group C causes.

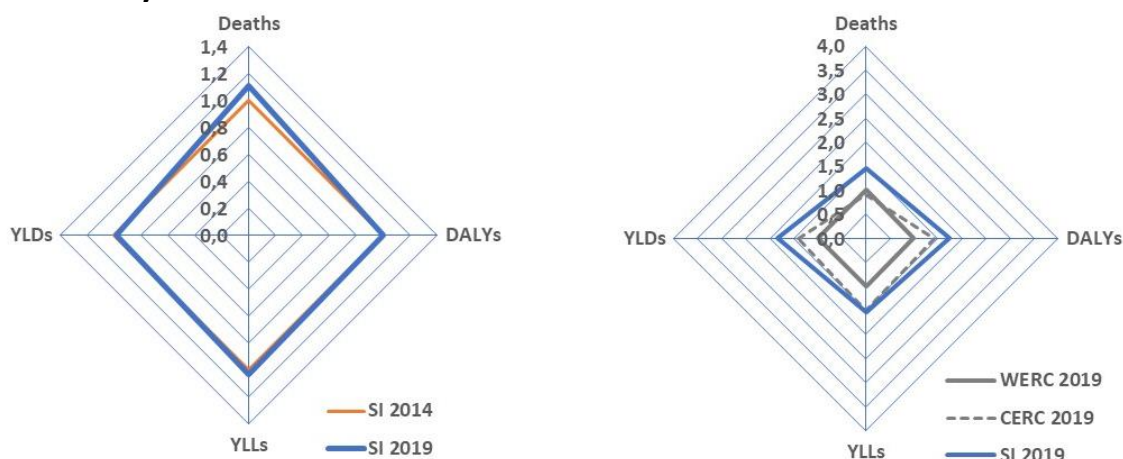
No important ratios of rates in Slovenia in 2019 versus 2014 were observed in any of injury group subgroups (Figure 4).

Figure 4. The ratios of rates in Slovenia in 2019 versus rates in 2014 (left diagrams), and the ratios of rates in Slovenia and rates in CERC versus rates in WERC (right diagrams) within group of injuries.

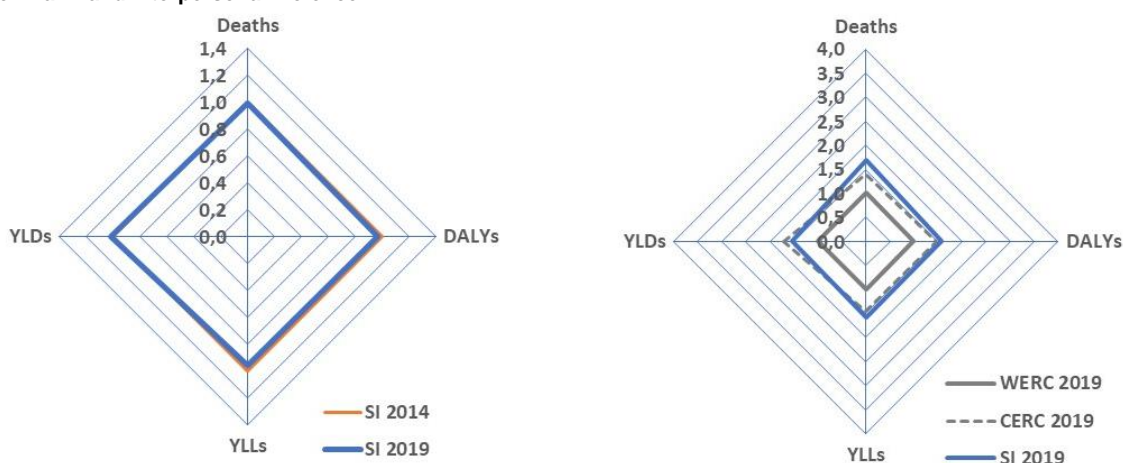
LEGEND: Deaths=overall mortality; DALYs=Disability Adjusted Life Years; YLLs=Years of Life Lost; YLDs=Years Lived with Disability – all per 100.000 population; WERC=Western Europe Region countries; CERC=Central Europe Region countries.

INJURIES

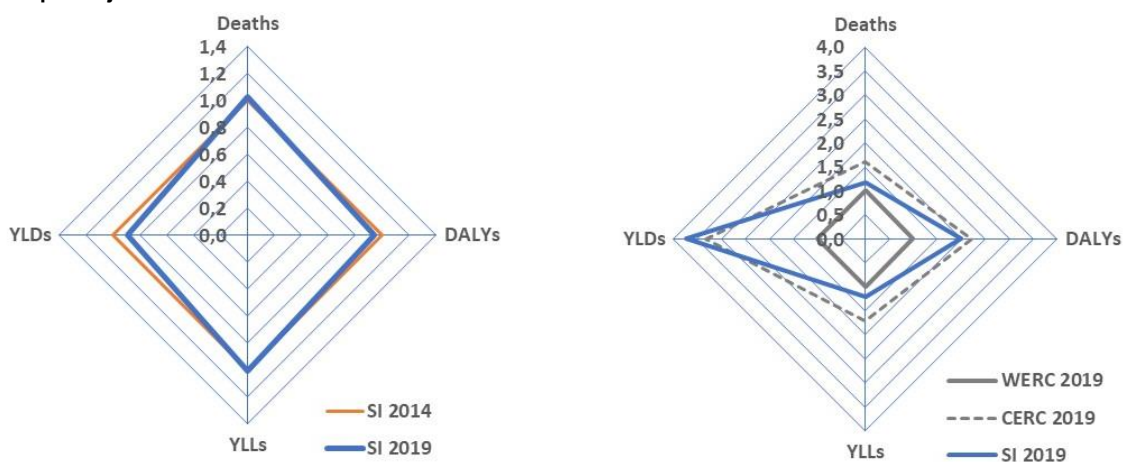
a) Unintentional injuries



b) Self-harm and interpersonal violence



c) Transport injuries



When comparing Slovenia to WERC, importantly higher rates were noticed in Slovenia in all groups of injuries (unintentional injuries: overall mortality: 1.45, DALYs: 1.74, YLLs: 1.54, YLDs: 1.83; self-harm and interpersonal violence: overall mortality: 1.69, DALYs: 1.58, YLLs: 1.59, YLDs: 1.54; transport injuries: DALYs: 1.99, YLLs: 1.22, YLDs: 3.73) (Figure 4).

The comparison of CERC to WERC on more aggregated level suggested that in all injury subgroups the rates seem to be mainly much higher in Slovenia and CERC than in WERC (Figure 4).

Presentation of BoD by more disaggregated causes groups is available in Supplementary 3, where much higher BoD in terms of YLDs in road injuries in Slovenia in comparison to WERC can be observed.

Discussion

The main results showed that in Slovenia in the observed five-year time span the basic MPHPs, cardiovascular diseases and neoplasms, remain at the forefront, however, their burden did not increase. On the other hand, slight increase in mortality has been observed in some other diseases that are at the forefront in older population groups (neurological disorders, mainly at the expense of Alzheimer's disease and diabetes). The used visualisation also clearly pointed out a substantial BoD generated by health problems with burden expressed in terms of disability - the contribution of burden in terms of YLDs was substantial in musculoskeletal and mental disorders, and unintentional injuries.

Our study suggested that in the years 2014 and 2019 non-communicable diseases generated the biggest part of the BoD, with cardiovascular diseases and neoplasms as the leading causes on general. This is not something new and prevention programs have been underway for many years to reduce the BoD of these causes. In addition

to health promotion carried out by the National Institute of Public Health, the primary prevention of chronic non-communicable diseases in Slovenia is now carried out in the so-called reference family medicine clinics (11). On the other side, the results also exposed a substantial BoD generated by health problems with burden expressed in terms of disability, among which musculoskeletal and mental disorders should be pointed out. This means that focusing on mental and musculoskeletal disorders prevention, which has been taking place in Slovenia in the last few years, was the right decision (12,13). It should be noted, however, that there is a high probability that, according to some authors, the burden of mental disorders is underestimated (14,15), also in terms of mortality. This problem is related to another problem that is much bigger in Slovenia than in WERC - mortality due to alcohol use. Regarding drinking alcohol beverages, Slovenia ranks among the so-called wet cultures, characterised by tolerance towards drinking alcohol, and even the encouragement of such behaviour (16). Slovenia is trying, more or less successfully, to manage this problem by gradually introducing new public health measures (17). Next, results clearly showed, is that in injuries the greatest BoD fell on disability, mostly due to unintentional injuries, mostly at the expense of falls. To some, such a result would seem unusual, as the general population tends to have more visible health problems that create BoD in terms of death, among injuries, especially deaths in road accidents, which receive the highest attention in the media. However, such a result is not unexpected if we also consider BoD in terms of disability. In elderly, falls can lead to more complex hospital treatment of injury, and precipitate disability and consequently significant general health loss and finally death, while younger persons can suffer disability for the

rest of the life, leading to income loss and dependence on caregivers (18). The problem of falls in Slovenia is already known (18). Among the causes, there is a growing interest in extreme sports among the younger population (19). Also, Slovenia is a country with a large proportion of the elderly, of whom a large proportion live in rural areas (18). Both pose a major threat to unexpected falls. Aware of this problem, especially among the elderly and children/adolescents, Slovenia has undertaken activities in recent years, and strategies for management are already in place (20,21). On the other hand, the problem of road injuries is not negligible either. Trying to interpret much larger YLDs in Slovenia compared to WERC in road injuries, one of the most likely reasons is the high-quality organization of public emergency services, indicating that these services save many people's lives, however, as a result, there are more people with serious injuries, which is reflected in the YLDs rate (22,23). Finally, in the observed years, the Group A causes didn't pose a great BoD on the Slovenian population health. Consequently, only few things could be highlighted. First, results showed excellent neonatal care. This is in line with other data, showing Slovenia has the lowest neonatal mortality rates at and after 22 and 24 weeks of gestation in Europe (24). This, in turn, is associated with a moderately higher rate of YLDs in Slovenia in comparison to WERC, as very preterm birth is associated with disabilities in multiple developmental domains (25). Also, care for patients with HIV is very good in Slovenia. High-quality HIV treatment, including the latest antiretroviral drugs, is defined in the national strategy for HIV infection prevention and control (26).

The study has some potential limitations. First, one could argue the use of the IHME-GBD database, which offers global health statistics, to achieve the aims of this study due to criticism appearing due to the fact that the BoD

estimates were prepared by modelling, which was supposed not to be completely transparent (27,28). However, this problem seems to be solved now (4). On the other hand, from the point of view of our study, this database has some important advantages over other databases. For example, the OECD database provides some data on BoD, but not in a form that would allow to achieve the study aims, HFA database does not include indicators of disability and at the time of the study provided data only until 2015, while EUROSTAT database provides data only on some indicators and is targeted at EU countries, and at the time of the study provided data only until 2018 (5-7). Another important advantage of the IHME-GBD database is that it offers indicators for country groups that were most suitable for achieving the study aim. These groups are not ideal, however, the CERC group is a relatively good approximation for SEE countries - two thirds of the CERC are SEE countries, and the WERC group is a relatively good approximation of the EU before the accession of any of the SEE countries to the EU (developed countries of the western part of EU) as WERC is dominated by these countries. Additionally, this database offers the widest range of visualizations along with a rather high degree of flexibility. This is very important for decision makers (29,30). Second, one could argue why we didn't try to compare Slovenia with the entire EU. The reason is that we wanted a comparison with countries that are in many respects more developed than Slovenia, while actual EU includes many countries that are equally or less developed than Slovenia. Finally, the database seems not to be completely up-to-date - the situation of the COVID-19 pandemic is not yet included in the latest version. However, databases cannot be real-time, as raw data/information needs to be processed and prepared for use. A 2-year delay is thus quite common. Additionally, the BoD picture is not expected to shift very drastically in the direction of infectious diseases, as disruption in NCDs care provision together with the

financial crisis in time of pandemic will certainly have its impact (31,32).

On the other hand, the study has some important strengths. First, it exposed the importance of considering the BoD caused by disability and not just by mortality. Second, a very strong advantage is the visualization used. All kinds of visualizations in the IHME-GBD database are excellent and understandable, however, for decision-makers the information often needs to be even more concise. The polar plot has proven to be very suitable in such cases (29,33), as it allows the simultaneous presentation of contribution of several diseases for the same BoD indicator or of several BoD indicators for the same disease. Finally, the approach is useful in education, so it makes sense to use in the training of future public health experts, especially potential future decision-makers.

The study provides important information for decision-makers. In the context of the EU accession process, it could be pointed out that SEE, including Slovenia, face the challenge to reach a level of quality and achievement in health care in the EU, more specifically in the developed countries of a western part of EU. The analysis showed that Slovenia is somewhere between WERC and SEE - in some respects is similar to WERC and to SEE countries in others. It is also interesting to note that on more aggregated level in some respects both, Slovenia and SEE countries, don't deviate much from WERC (communicable diseases, neoplasms, neurological disorders, and sense organ diseases), while in some respects Slovenia, together with SEE countries (musculoskeletal and mental disorders, chronic respiratory diseases, skin diseases and nutritional deficiencies) or itself (maternal and neonatal conditions), perform even better than WERC. Unfortunately, both Slovenia and SEE countries, are performing significantly worse in some MPHPs. The study thus showed MPHPs in which a lot has

to be done in Slovenia (alcohol use) or SEE countries (cardiovascular diseases, diabetes), or both (digestive diseases, injuries), to reach rates in WERC. This will certainly be achieved sooner with appropriate public health education of workforce (34,35).

In continuation of this research, additional in-depth analysis with regrouping of causes would be needed to highlight more accurate burden of some groups of causes. One example are mental disorders that overlap at least with substance use disorders and self-harm injuries (14). Additionally, the classification of Alzheimer's disease, officially considered a neurological disorder, is also blurred. Due to its expression in terms of mental changes, it can also be considered a mental disorder (15,36).

Conclusion

In Slovenia, in the observed five-year time span the two basic MPHPs remain at the forefront - cardiovascular diseases and neoplasms. However, their burden didn't change. The importance of causes whose majority of the BoD is expressed mainly by disability and which has been neglected in the past due to the lack of appropriate indicators - musculoskeletal and mental disorders, and unintentional injuries – was proved. The study also identified MPHPs in which a lot has to be done in Slovenia (alcohol use) or SEE countries (cardiovascular diseases, diabetes), or both (digestive diseases, injuries), to reach rates in WERC. In this context in some respects Slovenia is similar to WERC and to SEE countries in others. Polar plots, which allow simultaneous view on several dimensions of BoD proved to be very useful.

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