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Burden of Disease of Estonian Population

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The burden of disease methodology describes the gap between the best possible and actual state of health of the population. Burden of disease calculations are based on morbidity and mortality statistics, disease severity assessments and the age of persons at the time of death. As a result a more comprehensive picture of morbidity and mortality effects on population health is achieved in comparison to what is commonly available from traditional health statistics. This policy brief uses the most recent burden of disease data from 2006 and gives a short overview on the topic with the most important age, gender, regional and disease distributions presented. Moreover, the current policy brief is a first-time attempt to provide an introduction to possible links between socioeconomic factors and burden of disease.

Introduction

The last decades have witnessed increased use of various indicators that are based on the concept of health gap and which measure the difference between the ideally possible and actual state of health. Since the completion of the Global Burden of Disease (GBD) study in 1996 the burden of disease (BoD) approach has achieved wide use in the assessment of population health on global, regional and country levels. This methodology has also been applied in setting health priorities and development of national health policies due to the possibility of combining the effects of premature mortality and lifetime morbidity into one summary measure.

In order to determine BoD caused by premature mortality Years of Life Lost (YLL) are calculated by summing up all individual life expectancies at the age of death in different disease, age, gender, region or any other relevant strata. Thus, in the current context a death is premature if it occurs before the end of the person's life expectancy. Hence, the younger a person dies, the greater the YLL. In order to determine BoD caused by morbidity Years Lived with Disability (YLD) are calculated by multiplying the number of disease cases (i.e. disease prevalence) by disease-specific severity assessments (i.e. quality of life assessments) in different disease, age, gender and any other relevant strata. Severe diseases have significant effect on quality of life, ability to work or perform any other activities and thus person with such a disease may lose almost an entire life year while a person with a mild disease might lose only a fraction of a life year. Total BoD is calculated by summing YLL and YLD and is expressed by Disability Adjusted Life Years (DALYs). In conclusion, the advantage of the BoD methodology is that by taking into account the age at the time of death and the severity of the disease a more comprehensive picture of population health is gained in comparison to classic health indicators of morbidity and mortality.

The results presented in the current policy brief have been calculated using 2006 data from the Estonian Health Insurance Fund (EHIF) and Statistics Estonia (SE). A more detailed overview of the BoD methodology is available from earlier study reports produced in cooperation of Department of Public Health of the University of Tartu and the Ministry of Social Affairs with support from World Health Organization (WHO) and from international literature (see the Reference section of this policy brief for references).

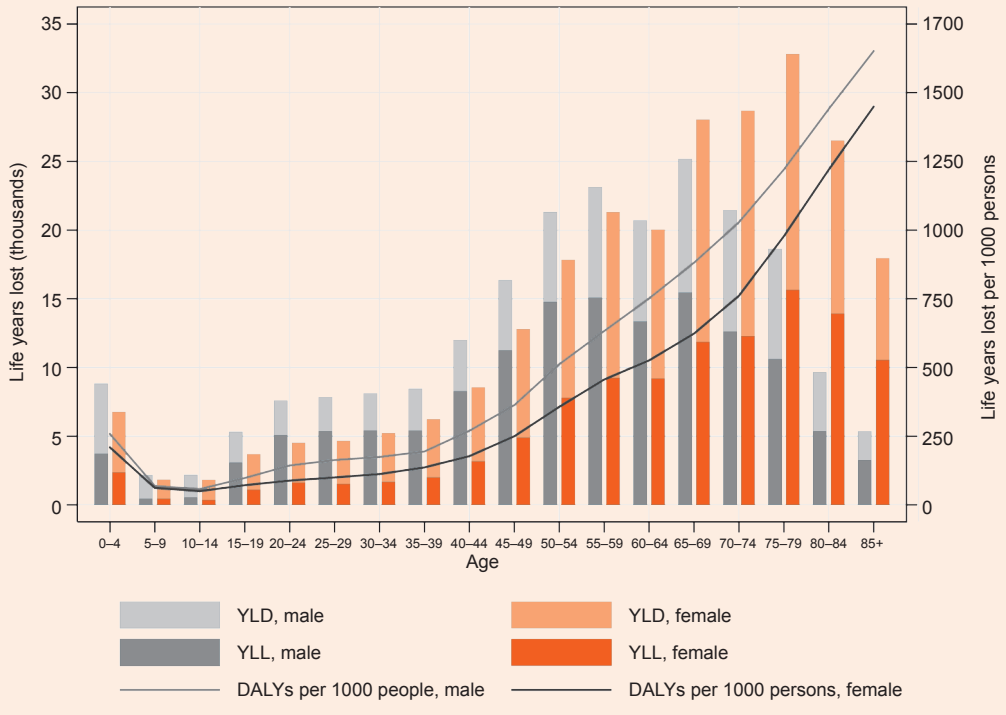
The aim of the current policy brief is to give an overview of BoD in Estonia along with identification of the main causes and age-gender-region distributions of BoD. Additionally, we also give a first time introduction to the topic of interactions between regional socio-economic situation and BoD.

1. Burden of disease in Estonia

Burden of disease is a measure indicating differences between the best possible health and actual population health using disability adjusted life years.

In 2006 the population of Estonia lost 474,521 DALYs, of which men lost 224,710 and women 249,811 (figure 1). Mortality and morbidity contribute quite equally to the overall burden with a 52% and 48% share, respectively. However, YLL is predominant for males and YLD for females – the proportion of YLL in gender-specific BoD is 62% and 44% for males and females, respectively. The ratio of YLL and YLD varies even more if one takes age groups into account. For example, in case of 15–64-year old males the YLL proportion reaches 69%, making mortality-related burden of disease the main reason for excessive DALYs of males of working age compared to females. From 65 years onwards female DALYs exceed that of males both in regard to YLL and YLD. Nevertheless, DALYs per person for males and females are equal from age 15 upwards. Overall, Estonian males have lost 64% and female 48% of the gender-specific DALYs by the age of 65 and older age groups thus contribute only 36% for males compared to 54% in females.

Figure 1. **Years of life lost (YLL) and years lived with disability (YLD) by gender and age groups along with disability adjusted life years (DALYs) per 1000 persons, 2006.**



Approximately 37% of DALYs in Estonia are caused by cardiovascular diseases (figure 2). A gender comparison shows that this disease group causes a larger proportion of DALYs among females compared to males. Additionally, the cardiovascular burden among males is mostly mortality-related (65%) while YLLs account for 51% for females. On the population level cardiovascular diseases are followed by neoplasms, and injuries and poisoning which respectively account for 15% and 10% of the total burden of disease in Estonia. In case of the two latter disease groups mortality-related burden plays an immense role. For example, in case of injuries and poisoning YLLs account for as much as 93% of male BoD.

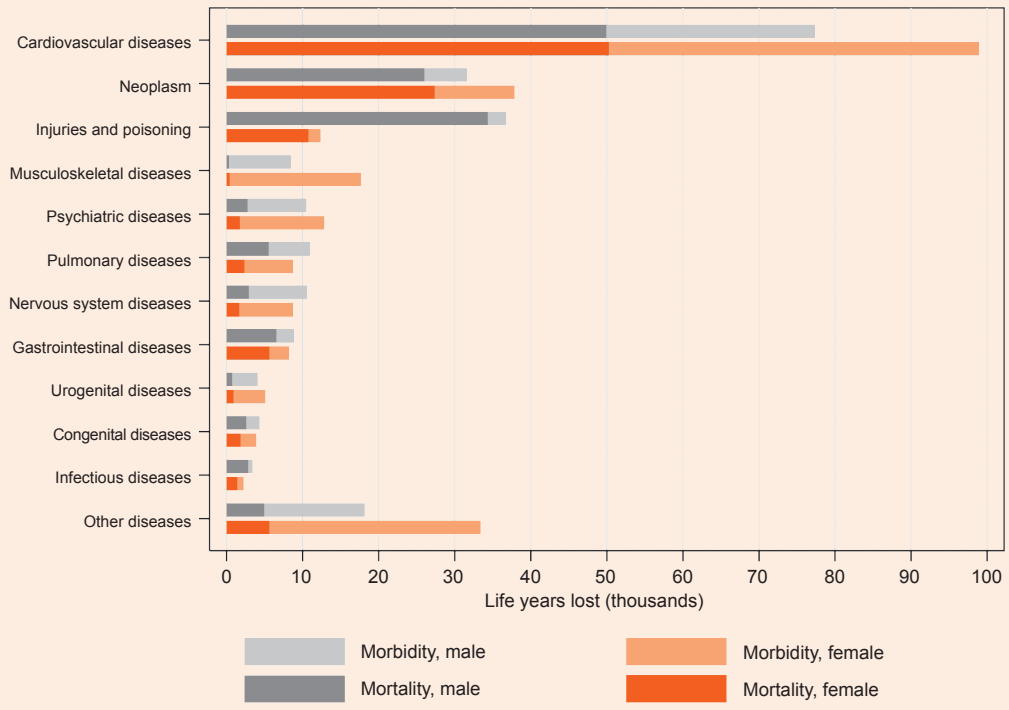
Even more noteworthy is the fact that injuries and poisoning among 20–24-year old males constitute 58% of the DALYs in this age group (figure 3). More than 30% of the DALYs among 10–44-year old males are associated with injuries and the injury burden among males exceeds the female injury burden even at age 70 and older.

A broader view of burden of disease by gender and disease groups again reveals important health losses especially among younger males. Females are more likely to suffer life year losses in the second half of life when chronic conditions like cardiovascular, musculoskeletal diseases and other aging-related health problems such as vision and hearing loss become more prevalent. Still, even then musculoskeletal diseases do not account for more than 10% of the DALYs while vision and hearing loss contribute less than 9% of the DALYs in this age group.

Burden of disease data have been available in Estonia since 2000 (with the exception of 2004). A comparison of annual data shows a reduction of mortality-related burden both for males and females even though the overall burden of disease has increased (figure 4) on the backdrop of the aging of the population and increasing life expectancies. However, existing data do not provide an answer to what extent this increase in burden of disease has been caused by true increase in morbidity compared to other factors like more frequent use of health care services or

Estonian population lost 474,521 DALYs in 2006.

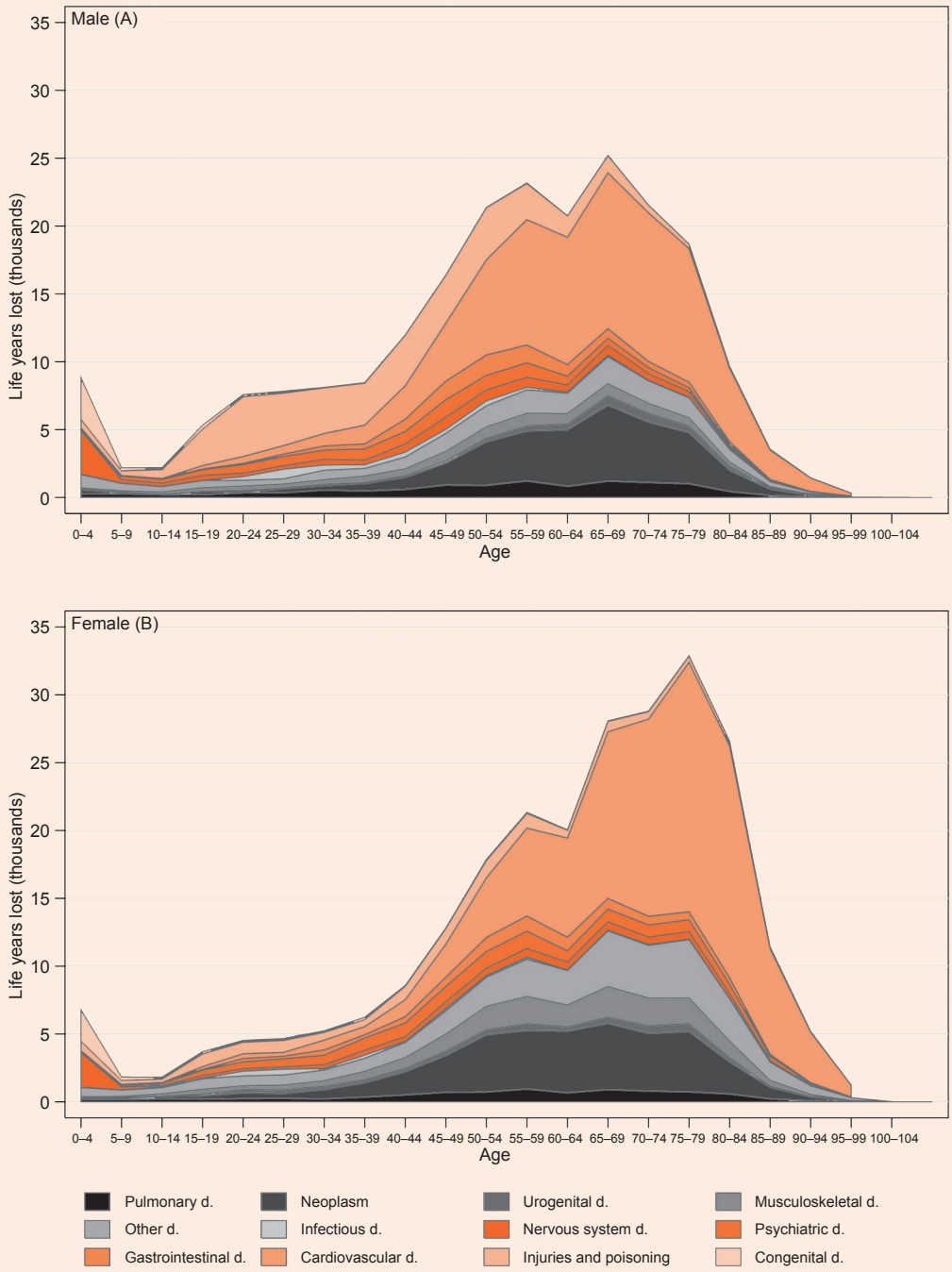
Figure 2. **Burden of disease by gender, disease group and component, 2006.**



The male burden of disease is mainly mortality-related, in young age groups and caused by cardiovascular diseases and injuries.

The main disease groups causing burden of disease in Estonia are cardiovascular diseases, neoplasms and injuries.

Figure 3. **Burden of disease (DALYs) by gender, age and disease group, 2006.**



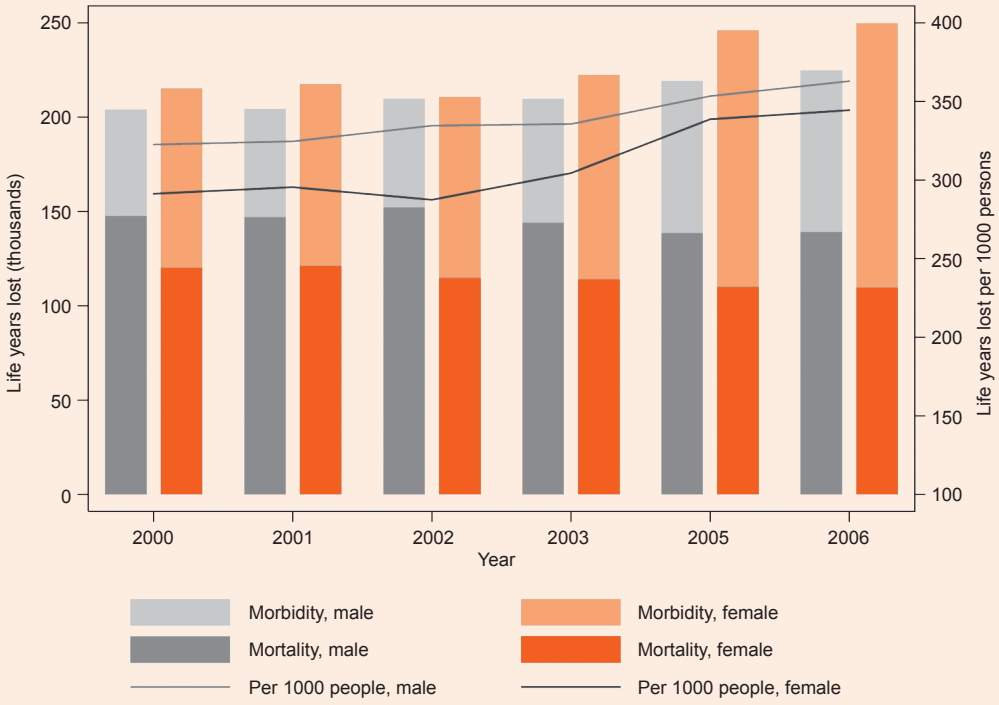
d. – diseases

any other change in the health care system. Thus, caution is advised in interpretation of the following time series.

Years of life lost accounted for 72% of the male and 56% of the female burden of disease in 2000. Since then burden of disease has increased by approximately 2% annually from 419,332 DALYs in 2000 to 474,521 DALYs in 2006. In addition to the increase of absolute numbers of DALYs there has also been an increase in the average number of DALYs lost per person – to a level of approximately 350 DALYs per 1000 persons in 2006. It is also noteworthy that the gender difference in DALYs per 1000 persons has decreased during 2000–2006, which can primarily be ascribed to faster morbidity growth among females.

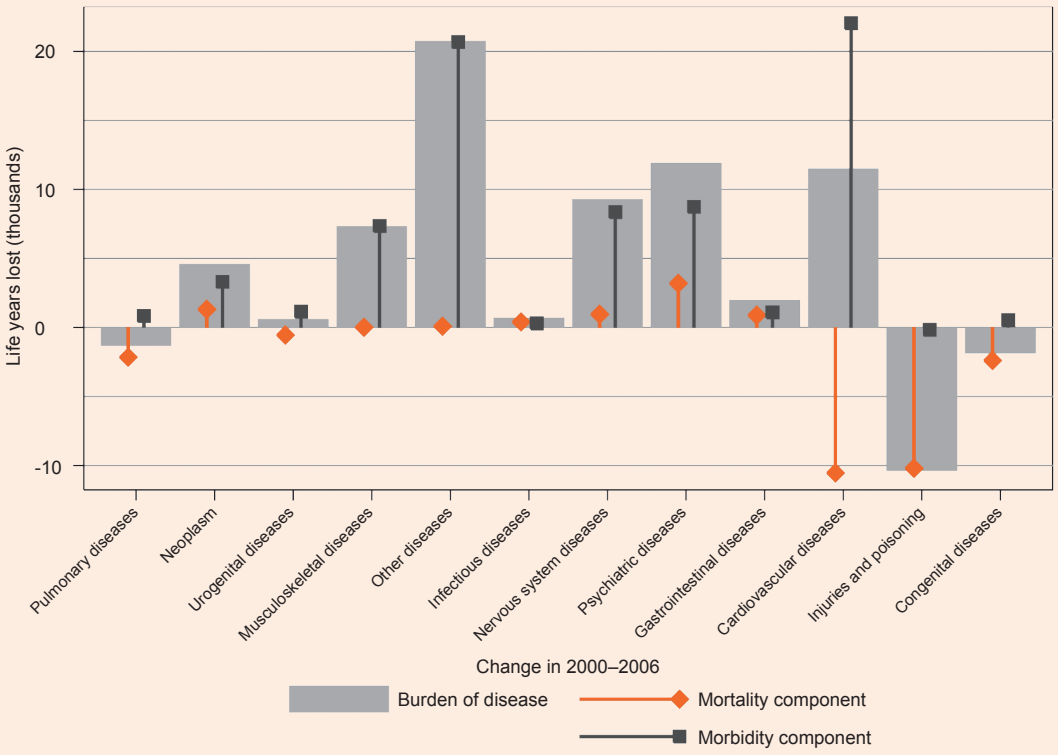
The most positive change in recent years has been the reduction of the burden caused by

Figure 4. **Burden of disease by component and burden of disease per 1000 persons by gender, 2000–2006.**



More than 50% of the burden of disease in Estonia stems from the working age population.

Figure 5. **Burden of disease in 2000–2006 by component and disease group.**



Mortality-related burden of disease has decreased and morbidity-related burden of disease has increased since 2000.

injuries and poisoning despite an overall increase in burden of disease. The main gain in injury burden has come from the reduction of mortality-related burden of disease (figure 5). Another disease group with a major reduction of mortality-related burden of disease is cardiovascular. The overall burden from the latter have however increased due to an increase in morbidity associated with longer life expectancies, aging population and other possible contributing factors. Similar increases are noticeable for all chronic diseases and conditions associated with older age.

Mortality-related burden of disease decreased the most in cardiovascular diseases and injuries while morbidity-related burden of disease increased the most in a number of chronic diseases.

2. Burden of disease in Estonian counties

The smallest burden of disease per 1000 persons in 2006 was found in Hiiu, Saare and Rapla Counties while the biggest was found in Ida-Viru, Põlva and Võru Counties (figure 6).

The differences in burden of disease in counties are remarkable with DALYs per 1000 persons varying from 305 to 408 while the Estonian average is 352 DALYs per 1000 persons. There is no obvious cause, such as prevailing mortality-related burden of disease, that would explain these differences. For example, the county with the highest burden of disease (Ida-Viru) differs from the Estonian average especially in regard to high mortality-related burden while the counties with the second and third highest burdens of disease differ from the national average mainly with regard to the morbidity burden (figure 7). On the other hand, Harju and Tartu Counties have slightly higher-than-average levels of morbidity-related burden but significantly lower levels of mortality-related burden, which in summary places these counties below the national average in the overall burden of disease ranking. There are no significant differences between county and national averages in regard to disease groups causing burden of disease.

Figure 6. **Burden of disease per 1000 persons in Estonian counties along with mortality and morbidity proportions, 2006.**

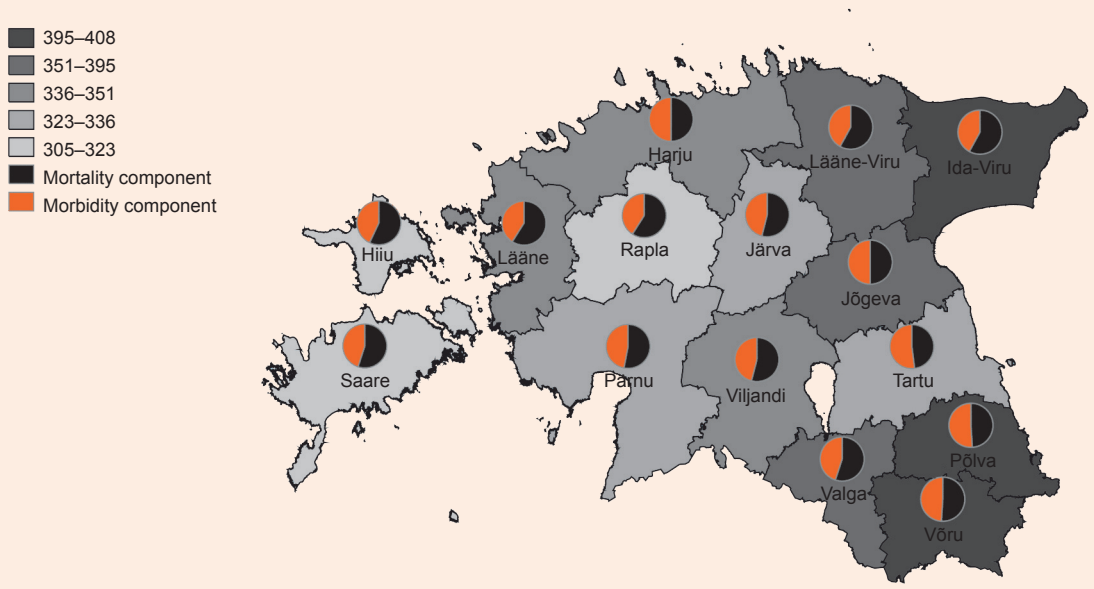
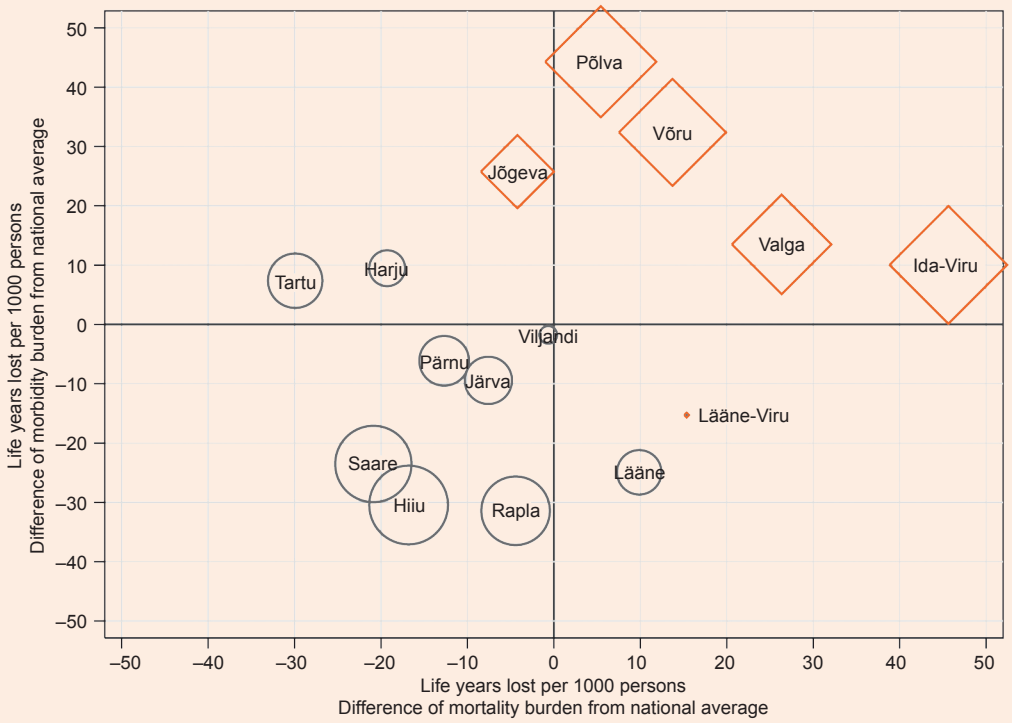


Figure 7. **Burden of disease (DALYs per 1000 persons) in Estonian counties: overall and component differences from the national average, 2006.**



Symbols: Diamond – burden of disease per 1000 persons higher than the national average; circle – burden of disease per 1000 persons lower than the national average. The size of symbol represents the relative difference from the national average measured in DALYs per 1000 persons.

Hiiu, Saare and Rapla Counties had the lowest and Ida-Viru, Põlva and Võru Counties the highest levels of burden of disease per 1000 persons in 2006.

3. Burden of disease and socio-economic status in Estonian counties

Investment in health is one of the important ways to improve the economic prospects of an economy. The health status of a population deeply influences the supply of labour force and its productivity and thus the country's economy in its entirety. Improved health enables people to acquire new skills and knowledge while it also enables them to invest more into continuous improvement of their health and intellectual capital.

The interactions between health and economics have been studied extensively and are discussed in many international documents[1]. European countries all signed the Tallinn Charter and confirmed their belief that investing in health is investing in human development, social well-being and wealth.

The most important study on this topic in Estonia in recent years is titled The economic consequences of ill-health in Estonia 2004–2006 and was carried out in cooperation with the PRAXIS Center for Policy Studies, Ministry of Social Affairs and the World Health Organization in 2006. The study found that reduction of adult mortality by 1.5% now would produce a 14% increase of national gross domestic product per person (GDP per capita) in 25 years. The study also

[1] For example, the World Health Organization (WHO) report *Macroeconomics and health: investing in health for economic development* and the European Commission report *The contribution of health to the economy in the European Union*.

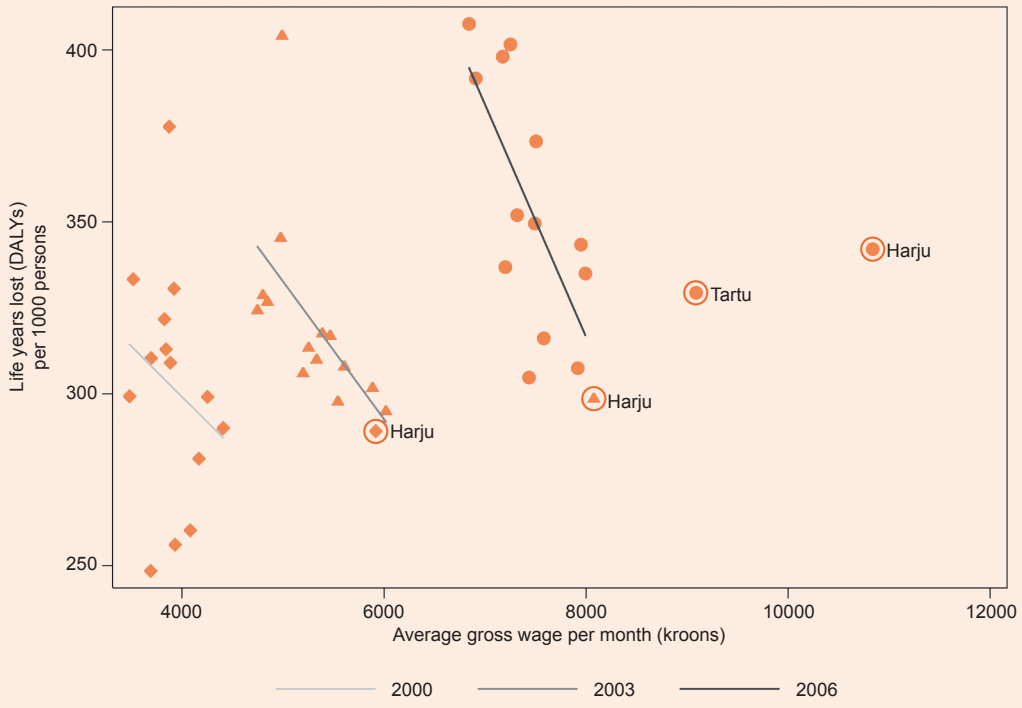
Gross wages became increasingly important determinants of burden of disease and barriers to attaining good health in all counties except Harju and Tartu.

found that males with poor health worked 12 hours less every week and females with poor health 8 hours less every week compared to their healthy counterparts while both additionally had 20% lower salaries compared to their healthy counterparts. Other studies also show that in more than a half of all cases economic barriers are the reason for not attaining health care services[2]. All the above means a vicious circle for people in low socio-economic groups – low economic status is hindering their health improvement while poor health is a barrier for improving their economic situation.

The current policy brief provides a first time introduction on the interactions between regional burden of disease and selected socio-economic indicators. The socio-economic indicators were selected to highlight the economic situation of individuals, the regional labour market situation and self-assessed health. Additionally, we present data on the correlation of distance from municipality to county centre and burden of disease. All indicators on the socioeconomic status came from Statistics Estonia databases. It is also important to note that our analysis does not adjust for gender-age differences between counties due to specifics of burden of disease methodology.

Gross wages were used to indicate the economic situation in the county, and were found to be strongly correlated to regional levels of burden of disease (figure 8). Higher gross wages are predictors of lower levels of DALYs lost per 1000 persons in the region. However, this correlation is capped at approximately 8000 kroons a month as the two counties with the highest income levels show higher burden of disease levels than predicted by the gross wage data.

Figure 8. **Regional gross wages and burden of disease in Estonian counties over time.**



Diamond – data from 2000; triangle – data from 2003; circle – data from 2006. Observations excluded from regression analysis have been circled.

[2] For example "*Ebavõrduses tervises – lahendamata väljakutse*" (*Inequality in health – an unsolved challenge*), Estonian Statistics collection Social Trends.

The interactions of socio-economic status and burden of disease have more facets than one might conclude from figure 8 and manifest through many other factors. For example, possibly worse access to health care services in counties other than Harju and Tartu might artificially reduce the levels of morbidity-related burden in our study or increase it in Harju and Tartu Counties on the other hand.

Analysis of gross wages over time in Harju and Tartu Counties in comparison to the rest of the counties reveals that differences between these two groups of counties have increased annually. Inside the second county group, the gross wage differences have however decreased while burden of disease differences have increased. Thus, low gross wages have gradually become more and more important barriers for attaining good health and reducing the burden of disease. It is likely that these types of economic barriers of health will continue to increase during the current economic crisis.

The counties with lower levels of burden of disease are characterised by higher employment and employees in these counties can additionally work more hours (figure 9). An example from 2006 shows that a 1% decrease in burden of disease per person would have resulted in a 0.4 percentage point increase in employment. Moreover, the counties with a lower burden of disease have a higher proportion of people who consider their health to be good or very good. Naturally the people living in such counties hence have a better capability of continuously maintaining and improving their health and indirectly also improving the general labour force productivity of the county. One also cannot ignore the fact that the counties with a lower burden of disease have fewer people living below the poverty level – the proportion of this population group decreases by 0.4 percentage points for every 1% reduction in burden of disease per 1000 persons.

The indicators described previously in this section were to a greater or lesser extent rela-

Figure 9. **Burden of disease in relation to selected socioeconomic factors on the county level, 2006.**

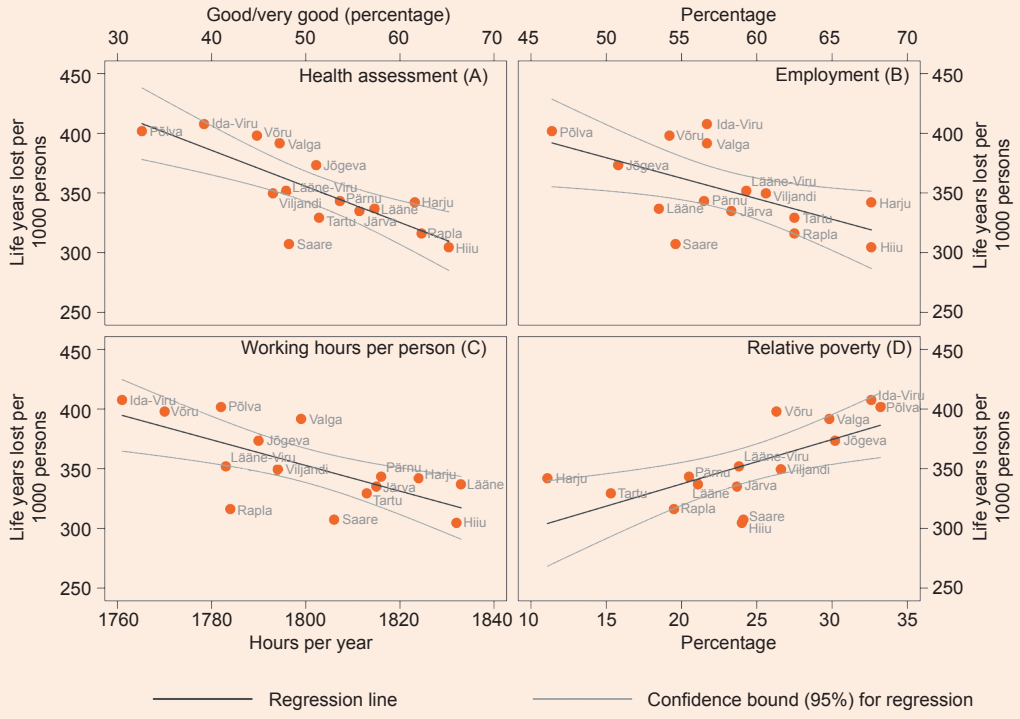
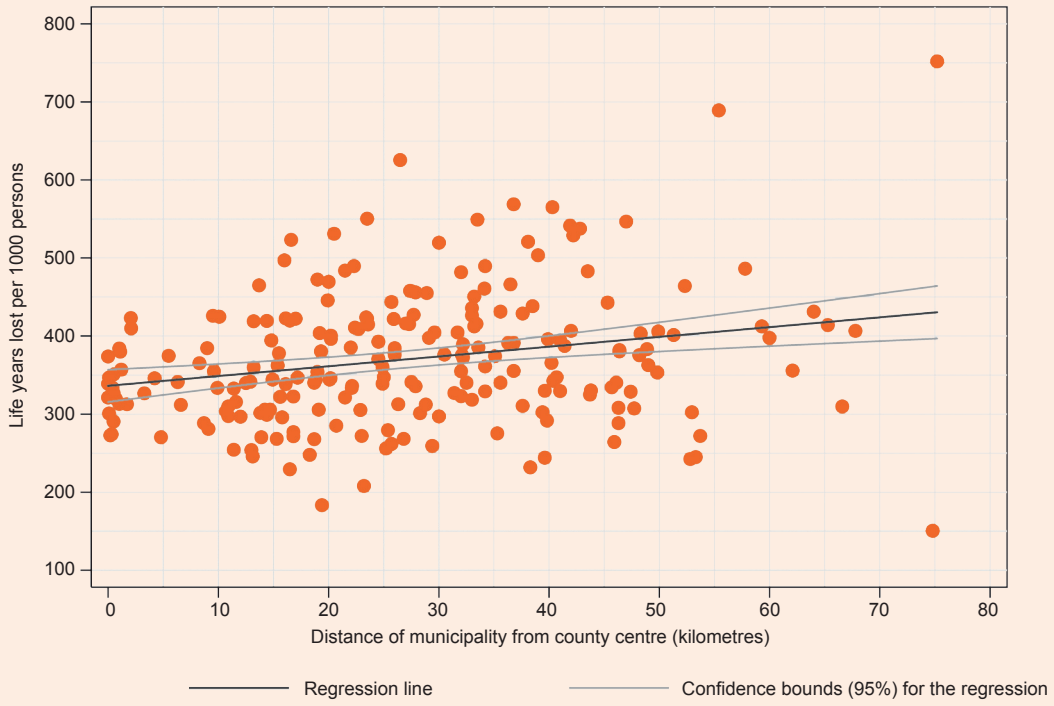
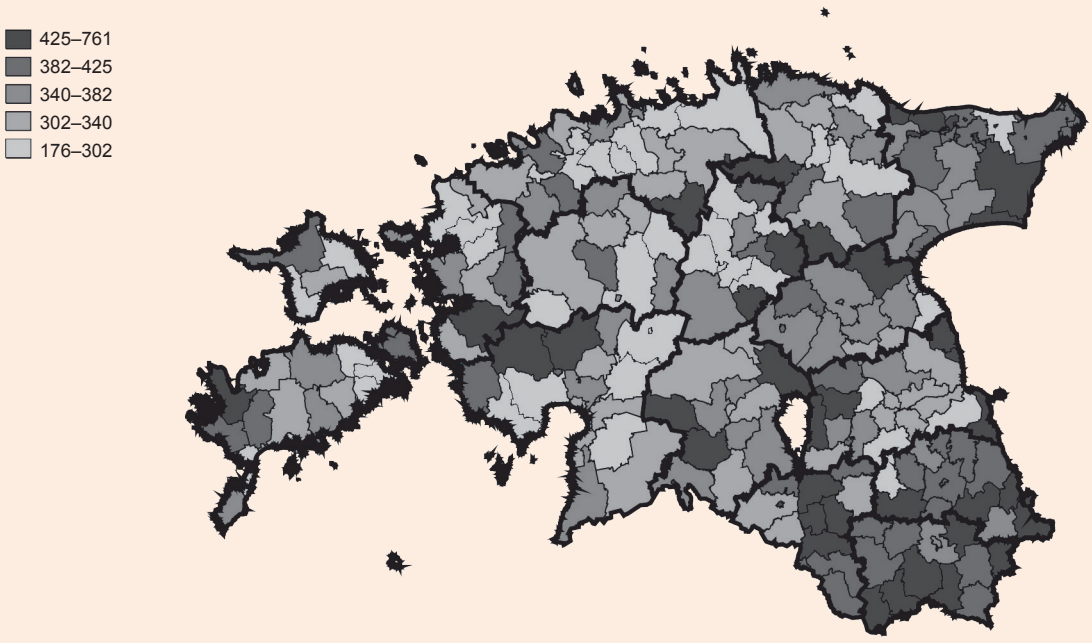


Figure 10. **Burden of disease and distance of municipality from county centre, 2006.**



Increased distance between municipality and county centre is correlated to higher levels of burden of disease and poorer health in Estonian municipalities.

Figure 11. **Burden of disease (DALYs) per 1000 persons in Estonian municipalities, 2006.**



ted to the economic situation of counties but another descriptor important in explaining the causality of regional burden of disease is the geographical location of a county. Namely, we can presume that ease of access to health care services and coverage with public health activities decline with increased distance from service providers, which in turn translates to poorer health in more distant areas and more life years lost. There is data available on distance of municipalities from county centres in Estonia. Our analysis shows that the further away a municipality is from the county centre, the higher the burden of disease per 1000 persons. Every additional kilometre of distance adds 0.3% to burden of disease per 1000 persons (figure 10). Similar empirical conclusions can be made from figure 11 where municipalities with the highest burden of disease tend to be located near the county borders most often.

Summary

The burden of disease methodology describes the health gap between the best possible and actual state of health of a population by merging mortality and morbidity data into one indicator using time as a common denominator. The burden of disease is hence the additional healthy time that an individual or a population could have used if there had been no disability or premature deaths. The aim of the current policy brief is to give an overview of the burden of disease in Estonia.

The Estonian population lost 474,521 life years in 2006 according to the latest available data. These lost life years approximate to a loss of input from 6498 persons if the Estonian average life expectancy at birth (73 years) were used as a comparator. The direct loss for the economy is approximately 50 000 working hours that were lost due to poor health or premature deaths in the working age population.

One of the most important sources of burden of disease are premature deaths among young males, which are mainly caused by cardiovascular diseases and injuries – among 20–24-year old males, injuries account for 58% of the total male burden of disease. Overall, 64% of the male burden of disease is there before age 65. Females on the other hand have a larger share of morbidity-related burden and especially from chronic diseases in later age groups compared to males. Overall, three main disease groups causing burden of disease in the Estonian population are cardiovascular diseases, neoplasms and injuries and poisoning which cause, respectively, 37%, 13% and 10% of the total burden of disease in Estonia.

The most positive finding of the current analysis is that the burden of disease from premature mortality has decreased since 2000. Especially remarkable is the decrease of the mortality-related burden from cardiovascular diseases and injuries. However, the total burden of disease has increased since 2000 due to higher disease prevalences reported.

The lowest level of burden of disease per person is present in Hiiu, Saare and Rapla Counties while it is the highest in Ida-Viru, Põlva and Võru Counties. Our analysis showed that a high level of burden of disease is related to lower gross wages, which is an obstacle to ensuring health while poor health is a barrier for gaining higher economic status. Between 2000 and 2006 income levels have gradually become increasingly important determinants of burden of disease but also more important barriers for attaining good health in all Estonian counties except Harju and Tartu. The latter two have seen faster wage increases compared to other counties while burden of disease levels in these counties are considerably higher than could be predicted based on the average wages. There are several other indicators that help us understand the particular burden of disease levels in Estonian counties – for example every additional kilometre

between the municipality and county centre adds 1 lost life year for every 1000 persons in the municipality. However, this has been only the first step in the analysis of interactions between burden of disease and socio-economic factors and further research on the effects of age-gender distributions, other sources of income, access to health care services, etc., on burden of disease should be carried out

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The Burden of Disease of Estonian Population

- A description of burden of disease methodology
- Distribution of burden of disease by mortality and morbidity causes
- Distribution of burden of disease by gender, age and disease groups
- Distribution of burden of disease by counties
- Introduction to interactions between regional burden of disease and socioeconomic indicators

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