

HEALTH CARE DECENTRALIZATION: A CASE STUDY OF BOSNIA AND HERZEGOVINA

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Abstract

The new century has seen an increased interest in the debate regarding the health care decentralization as a policy with a potential to address the rising problems of the modern health care. This thesis will assess decentralization in the public health care sector by estimating the average treatment effects of decentralization on health care financing, health of the population, and on the regional inequalities in provision of health care services. The analysis is based on the specific framework within Bosnia and Herzegovina. The country has two entities: the Federation of Bosnia and Herzegovina with a decentralized and Republic of Srpska with a centralized health care system. This unique framework allows for the assessment of the health care decentralization by estimating the average treatment effects in the ‘natural experiment’ setting. This thesis finds that public health care decentralization seems to lead to lower financial efficiency in the health care sector, to poorer health of the population, and to a more unequal delivery of the health care services. The findings imply that the Federation of Bosnia and Herzegovina should gradually start to centralize its public health care system.

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Introduction

Decentralization implies the transfer of authority from the central to the lower levels of government (Saltman, Bankauskaite, & Vrangbaek, 2006, p. 10). In general, the prevailing benefit of the decentralization is the ability of the smaller units to “reflect local needs and preferences better and thus improve efficiency” (Rodden, Eskeland, & Litvack, 2003, p. 3). Therefore, the smaller organizations, if properly structured and managed, are “inherently more agile and accountable than are larger organizations” (Saltman et al., 2006, p. 1). However, the decentralization may incentivize opportunistic behavior among the state and local officials, inducing the overspending and wasting of the public resources.

The debate on the decentralization and its multi-dimensional effects has strong policy implications for the health care sector. The rising cost of health care “has become a global concern in contemporary political discussions” (Chapman, Kern, & Laguecir, 2014, p. 353). In the previous three decades, the “health care expenditure has been growing much more rapidly than GDP in all OECD countries” (Pammolli, Riccaboni, & Magazzini, 2012, p. 623). The unconventional inflationary prices coupled with scarce finance urge for identification, formulation, and evaluation of various policies that may provide for increasing efficiency in the modern health care. One potential policy is the health care (de)centralization. In accordance to the definition for the overall decentralization, the decentralization in health care refers to the transfer of health care authority from the central to the lower levels of government. The new century has seen a rise in the re-centralization of the health care as a response to growing complexities within the sector (Saltman, 2008, p. 104).

This thesis aims to assess the effectiveness of the public health care decentralization policy in addressing the evolving problems in the modern health care. The objective is to use the specific public health care environment in Bosnia and Herzegovina that allows for development of a ‘natural experiment’, which allows estimation of the average treatment effects of the decentralization on some health care outcomes. The hypothesis states that the centralized health care system is better than the decentralized. The decentralized system is expected to have higher administration costs that lead to lower efficiency in allocation of the public resources. **This thesis will use the ‘natural experiment’ environment of the health care systems within Bosnia and Herzegovina (B&H) to estimate the average treatment effects (ATE) of the public health care decentralization on (a) health care financing, (b) health of the population and on (c) regional inequalities in the health care provision.**

Overall, a causal effect may be identified in a perfectly randomized experiment where the untreated group is the counterfactual to the treated group. However, in social science, such experiment is mostly unattainable, which indicates that the inherent problem of the counterfactual in a policy evaluation requires pursuit of an evaluation framework that can approximate the true randomization process. The two health care systems within B&H provide for this evaluation framework that enables the quest of establishing the relationship between the decentralization in health care and the defined health care outcomes.

To achieve the stated goals, the thesis will compare the two health care systems within B&H: the decentralized system in the Federation of Bosnia and Herzegovina (FB&H) and the centralized system in the Republic of Srpska (RS). Therefore, to estimate the ATE of the decentralization, the Federation is the treatment group, and the Republic is the control group. This thesis will estimate the ATE as the difference between the outcomes in the treatment and control groups.

The indicated framework resembles the ‘natural experiment’ criteria in two ways. First, the two systems in B&H are the result of the country’s constitutional setting dating from the Dayton Peace Accords in 1995 that ended the four-year war and separated the country in the two administrative and legal entities – the FB&H and the RS. Therefore, the constitution is the external source of variation in treatment assignment. Second, the two entities are similar in many economic, social, cultural, historical, technological and political aspects; and at the end, they are part of the same country. In other words, the centralized system is a good counterfactual to the decentralized system. This means that if there was no decentralization in the Federation, the outcomes in the decentralized entity would have been the same as the outcomes in the centralized entity.

The analysis using the indicated method in the defined framework shows that the health care decentralization does seem to lead to higher financial inefficiency in the health sector, poorer population health, and the higher regional inequalities in the provision of the health services. Overall, the **analysis in this thesis will show if the Federation of Bosnia and Herzegovina needs to start centralizing its health care sector.**

The thesis contains three chapters. Chapter 1 outlines the existing literature on the decentralization in the health care sector, in particular its advantages and disadvantages. Chapter 2 presents and justifies the methodology used in this thesis, and contains five sections. The first section outlines basics of the program evaluation in social sciences focusing on explaining the ‘natural experiments’. The second section assesses the potential for the causal interpretation of the results by indicating potential demerits of the identified framework. The third and fourth sections proceed by describing in detail why the ‘natural experiment’ is a good method for the analysis in this thesis. The third section focuses on the constitutional setting in Bosnia and Herzegovina as a source of exogenous variation in the treatment assignment, and the fourth

section explains why the centralized entity in B&H is a good counterfactual to the decentralized entity. The final section of the second chapter defines the variables used in the analysis. Chapter 3 shows the analysis and the results. It contains three sections. First section will show the ATE of the health care decentralization on the health care financing. Health care financing is assessed using health care prices, contributions, expenditures and capacity. The section two will estimate the ATE of the health care decentralization on the health of the population. The health is measured using the mortality rate for different age groups, and the morbidity rates. The third section will estimate the ATE of the health care decentralization on the geographical inequalities in the provision of health care services. The inequalities are measured in terms of the health care contributions, expenditures and capacity.

Chapter 1 : Literature Review

The debate on health care decentralization has been gaining a new outlook in recent years. “In many European countries, since the World War II, there has been a trend towards decentralization of health policy to lower levels of governments, while more recently there have been re-centralization processes.” (Tediosi, Gabriele & Longo, 2009, p. 303) Therefore, the new century has seen a decreased popularity of the health care decentralization. Saltman (2008, p. 104) writes that “a major shift appears to be underway in Europe in the relationship between national, regional, and local control over health sector decision-making”. He asserts that “instead of reinforcing the continued decentralization of authority away from national governments, state institutions have reversed course and are seizing responsibility for substantive political and fiscal decision-making in European health care systems” (Saltman, 2008, p. 104). Therefore, the past two decades were marked by an increase in importance of the health care decentralization discussion. **This thesis will contribute to the existing literature by providing a support for the ongoing trend of re-centralization of the health care system.**

The World Bank (2011a) defines decentralization as “political reform, designed to reduce the extent of central influence and promote local autonomy”. Decentralization is, however, “a complex multilevel phenomenon, encompassing a number of political, fiscal and administrative dimensions”, and “it frequently has different meaning for different writers” (Saltman et al., 2006, pp. 9-11). In this thesis, the health care decentralization is perceived simply as the “transfer of authority and power from higher to lower levels of government or from national to subnational levels” (Saltman et al., 2006, p. 10).

The existing literature provides for argumentation both for and against the decentralization. In general, the decentralization is based on a simple idea suggesting that smaller organizations serve the needs of those they aim to represent much better than larger organizations. Saltman et al. (2006) outline the rationale of the decentralization by defining its seven objectives. These objectives of the decentralization are to (1) “improve technical efficiency”, (2) “increase allocative efficiency”, (3) “empower local governments”, (4) “increase the innovation of service delivery”, (5) “increase accountability”, (6) “increase quality of health services”, and (7) “increase equity” (Saltman et al., 2006, p. 16). Clearly, each of the objective is bound with controversies, including “negative outcomes of market-type relations in the health care”, “increased inequalities between administrative units”, and “unclear concepts of local and public participation” (Saltman et al., 2006, p. 16). Similarly, Saltman et al. (2006) also outline some general disadvantages of the health care decentralization. These include (1) “tensions between the national and local levels (that) arise when local levels need more financial resources and are unable to satisfy what they see as unnecessarily high standards from central government”, (2) no accountability of the sub-national units “to central government, which can complicate the mission of central government in decentralized settings”, (3) “the potential to increase inequalities”, and (4) reduced local incentive and discretion in development of innovative programs (Saltman et al., 2006, pp. 14-15). The findings of this thesis support the argumentation against the decentralization.

Furthermore, the existing literature assesses the decentralization using different variables, which may be grouped in three broad categories. First relates to the effects of the health care decentralization on the health care financing; second assesses decentralization in terms of the

health of the population; and third category relates to the effects of the decentralization on the inequalities in the provision of the health care services.

The authors that wrote about the effects of the decentralization on the **health care financing** include Arredondo and Parada (2000, p. 449) who “identified the effects of health care decentralization on health financing in Mexico, Nicaragua and Peru” using a longitudinal study. They outlined various strengths of health financing after health care decentralization, including higher community participation, new sources of financing, and higher contributions from homes that lead to higher availability of the funds to finance health care (Arredondo & Parada, 2000). On the other hand, aiming to “shed light on the main determinants of health care expenditure in a sample of 20 OECD countries for the period 1990 to 2000”, Mosca (2007, p. 514) empirically tested the effects of the decentralization on the health care expenditures. He found that the decentralization is associated with lower efficiency in resource allocation, and that it tends to lead to higher health care expenditures (Mosca, 2007).

Among other, Cantarero and Pascual (2008) wrote about the effects of the decentralization on **health of the population**, and estimated the effects using panel data for Spanish regions, from 1992 to 2003. They evaluated the health outcomes with measures of infant mortality and life expectancy, and found that the decentralization is correlated positively to the life expectancy and negatively to the infant mortality. Similarly, Jimenez and Smith (2005) analyze data on ten provinces in Canada and show that the decentralization has substantial positive impact on the population health. They assert that “results of the econometric estimations for Canada suggest that decentralization in Canada has had a positive and substantial influence on the effectiveness of public policy in improving population’s health (in terms of infant mortality)” (Jimenez & Smith, 2005, p. 41).

Furthermore, Cantarero (2005) made an important contribution to analysis of the effects of the decentralization on **inequalities in provision of health care services**. He empirically evaluated the effects of the decentralization on health care expenditures in Spain, in period from 1992 to 1999. He claims that “the most important determinant in the explanation of the volume of regional health care expenditure is the ageing population while other factors like the regional income and the relative structural characteristics of the supply variables have less importance” (Cantarero, 2005, p. 965). However, Tediosi, Gabriele and Longo (2009) discuss the effects of the decentralization to six regions in Italy on the inter-regional solidarity, and claim that it is possible but rather hard to maintain the support for the weakest regions and the support for the solidarity. They claim that “finding a balance between decentralization of institutional power and responsibilities and central support to the weakest regions is a tough and risky exercise for policy makers” (Tedioli et al., 2009, p. 311).

Overall, there is both quantitative and qualitative research regarding the health care decentralization effects on the various health care outcomes. Some authors find that the decentralization is superior to centralization in terms of these variables, while others find the contrary evidence. This thesis adds to this discussion by assessing decentralization in terms of all three groups of the variables, and finds conclusion in support of the claims that decentralization is not superior to the centralization. Moreover, the mentioned authors have used various models to portray both positive and negative sides of the health care decentralization. **This thesis will add to this discussion by using a ‘natural experiment’ found in the unique constitutional setting in Bosnia and Herzegovina (B&H).**

Moreover, the literature that empirically assesses the health care decentralization within B&H is quite limited. There is no literature that compares the two health care systems within the

country. B&H is composed of two entities: the Federation of Bosnia and Herzegovina (FB&H) with a decentralized health care system, and the Republic of Srpska (RS) with a centralized health care system (for details on the two entities in B&H, see sections 2.3 and 2.4). The existing literature on the health systems in the country is mostly descriptive. For example, Hrabac et al. (2011) describe the process of reform in the public health insurance during the transition from socialism to capitalism, Masic et al. (2006) provide for an overview of the decentralized health system, and Slipicevic and Malicbegovic (2012) examine private and public health sectors in the FB&H. This thesis will compare the decentralized system in the FB&H to the centralized system in the RS and provide for the policy suggestions for the improvement of the health care sector in the FB&H.

In conclusion, this thesis will add to the ongoing discussion on the effects of the health care decentralization on health care financing, health of the population, and inequalities in the health services provision. It will provide a support to the authors who have argued against the health care decentralization.

Chapter 2 : Methodology

This thesis identifies a ‘natural experiment’ environment with regards to the assessment of the health care decentralization in Bosnia and Herzegovina (B&H). B&H has two entities: the Federation of Bosnia and Herzegovina (FB&H) with a decentralized health care system and the Republic of Srpska with a centralized health care system. The method of the assessment is the calculation of the average treatment effect (ATE) of the decentralization in health care system in the FB&H. Thus, the health care system in the FB&H is the treated entity, while the centralized health care system in the RS is the control entity. The decentralization effect is assessed with various explanatory variables grouped in the three broad categories: health care financing, health of the population, and inequalities in health care provision.

This chapter of the thesis aims to provide for the evidence supporting the validity of the analysis presented in the chapter three. It contains five sections. The first section describes the basics of the social program evaluation, concentrating on the provision of the theoretical background regarding the ‘natural experiments’. The second section assesses the potential for the causal interpretation of the results by indicating limits of the identified framework. A ‘natural experiment’ exists if there is an exogenous source of variation in the treatment assignment, and if there is a good counterfactual to the treatment group. The third section will explain why the constitutional setting in Bosnia and Herzegovina is a good source of exogenous variation in the treatment assignment, and the fourth section will explain why the RS is good counterfactual to the FB&H. The final section will identify and describe variables used in the analysis.

2.1: The ‘Natural Experiments’ in Economics

When evaluating a social policy, researchers use various methods to observe the effects of the policy on the target population. To observe these effects, the researchers must observe the outcome of the policy on the population that is treated – the treatment group. In addition, to estimate the effects of the policy, the researchers must also estimate what the outcome would be in the treatment group had it not been treated. “This imaginary situation, what would have happened without the program, is called the counterfactual.” (Pomeranz, 2011, p.1) Therefore, the counterfactual is fundamentally unobservable as we know only the outcome that is being realized. If a policy is implemented, we do not know what the outcome would be if the policy was not implemented. Usually the counterfactual outcome is “represented by a group called the control group” (Pomeranz, 2011, p.1). Ideally, the outcome observed in the control group is the outcome that would be observed in the treated group had it not been treated.

Therefore, a good control group allows for the identification of the counterfactual, which ensures the causality in the relationship among the explanatory (independent) and response (dependent) variables. In plain language, the explanatory variables are “variables that help explain the change in the dependent variable”, and response variables are the “variables whose change the researcher wishes to explain” (Patel, 2009, p. 2). The identification of the causal relationship is “the objective of every impact evaluation” (Pomeranz, 2011, p.1). The causal interpretation refers to the claim: ‘A is the cause B’ (Nowak, 1960, p.23). Therefore, a causal relation in an evaluation of social programs infers our certainty that the policy has caused a certain outcome.

The ideal of the program evaluation is the perfectly randomized controlled trials (RCT), which implies that “each participant has the same chance of being assigned to either intervention or control” (Friedman, Furberg & DeMets 2010, p. 97). The randomization process is characterized as the “standard by which all trials are judged” as it ensures that the treatment and control groups are “comparable with respect to known and unknown risk factors”, and it “removes investigator bias in the allocation of participants” (Friedman et al., 2010, p. 97). Therefore, the RCT allows for the identification of the causal relationship among the explanatory and response variables.

The average treatment effect (ATE) is identified as (Little, 2013, p. 239):

$$ATE = E(Y^1_i - Y^0_i)$$

,where **$E(Y^1_i)$ is the expected outcome in the treatment group, and (Y^0_i) is the expected outcome in the control group.** The beauty of the RCT is that it provides for a good counterfactual so that it can be assumed that if those who are not treated were treated, their outcome would be the same as the outcome of those who are treated, and vice versa. Therefore, “in classical randomized experiments, it is straightforward to obtain attractive estimators for the average effect of the treatment, e.g. the difference in means by treatment status” (Imbens, and Wooldridge, 2008, p. 2).

However, the randomization in social sciences is usually unattainable, and most of the economic analysis is observational as assignment of the treatment is not perfectly randomized. To illustrate with a simple example, a government will never randomly assign interest rates in order to ensure the attainment of the causal relationship between the interest rates and inflation. However, “even if we cannot use controlled experiments to test what determines prosperity,

history may offer a natural experiment, in which we can convincingly argue that one factor changes while other potential determinant for the outcomes of interest remain constant” (Acemoglu, Johnson, and Robinson, 2006, p. 23). Therefore, researchers usually observe the variables as they occur, and they “seek to find variation that is driven by factors that are clearly identified and understood” (Meyer, 1995, p. 153).

‘Natural experiments’ are a type of the observational analysis given that they refer to the analysis of the “outcome measures for observations in treatment groups and comparison groups that are not randomly assigned” (Meyer, 1995, p. 151). However, the independent variable is “assumed to satisfy the randomness criterion” (Rosenzweig, & Wolpin, 2000, p. 828). To be considered as randomly assigned, there must be “transparent exogenous source of variation in the explanatory variables that determines the treatment assignment” (Meyer, 1995, p. 151). This exogenous variation may be induced, for example, by “policy changes (and) government randomization” (Meyer, 1995, p. 151). The ‘natural experiment’ is the method this thesis uses to assess the decentralization in the health care sector. The framework in this thesis is not RCT, so there can be no causal interpretation of the results. However, as the exogenous variation provides for the ‘as if random’ requirement, the strong association among the variables in the ‘natural experiment’ framework may be identified by estimation of the ATE. The analysis is ex-post, as the policy is evaluated after the actual implementation.

Overall, the natural experiment approach is based on the assertion that “if one cannot experimentally control the variation one is using, one should understand its source”; thus, this experiment “emphasizes the general issuance of understanding the sources of variation used to estimate the key parameters” (Meyer, 1995, p. 151). The following section of this chapter aims to

do exactly this: explain the source of variation in the treatment and control groups in the framework of the analysis chosen in thesis to assess the decentralization in the health care sector.

2.2: Limitations of the Method

Meyer (1995, p. 152) outlined the internal and external threats to validity “that may undermine the causal interpretation in studies”. This section will assess these threats within the framework used in this thesis. “**Internal validity** refers to whether one can validly draw the inference that within the context of the study the differences in the dependent variables were caused by the differences in the relevant explanatory variables.” (Meyer, 1995, p. 152). Meyer (1995, p.152) outlined and explained broad threats to the internal validity. These are described in the following paragraphs.

First, omitted variables are the variables other than the explanatory that can affect the response variable (Meyer, 1995, p. 152). The method used in this thesis (described in Section 2.1) minimizes this threat as the assignment to treatment is ‘as if random’. Nevertheless, there is still possibility that some variable other than decentralization may affect the ATE on the response variables. For example, the health care sector in the RS has close ties and cooperation with the health sector in the Republic of Serbia. There is close cooperation between the FB&H health institutions with the health institutions abroad, but it is questionable if the cooperation is as close as the RS-Serbia cooperation. Furthermore, various issues related to the privatization in the health care sector may have an influence on the health care outcomes. This, however, is a broad issue and is not directly covered in this thesis. However, as the entities are part of the same country, and they share many common characteristics with regards to the levels and processes of privatization, the privatization in the health sectors of the two entities is assumed to be highly

similar. Therefore, the most important omitted variable in the analysis presented in this thesis may be the different extent to which the citizens of the two entities use the health care services abroad.

Also, trends in outcomes that “produce changes as a function of the passage of time per se” is a threat to the internal validity (Meyer, 1995, p. 152). This threat may be assumed away in this analysis due to the similarities presented in the section 2.4, most notably the common monetary policy. Similarly, it can also be assumed that there are no omitted interactions, as there seems to be no “trend in the treatment group that is not present in the comparison group” (Meyer, 1995, p. 153).

Misspecified variances occur when a researcher overestimates the significance of the relationships between variables (Meyer, 1995, p. 152). An important issue with regards to this threat in this thesis is a small sample size, as the difficulty arises if the observed samples are not large enough to provide for the robust conclusions. This limitation cannot be assumed away, but can be minimized by observing the variables through a longer time period.

Furthermore, the potential of mismeasurement cannot be completely assumed away in any analysis. The fifth section of this chapter will show that most of the data used in this thesis comes from the records of the public health institutions, so the sources seem to be reliable. However, there can still be errors in the way data is recorded and processed. Additionally, doctors may fail to give a correct diagnosis, people can be sick without being aware of the sickness or people can be sick but not visiting the health care professionals. These possibilities create a potential for a wrong measurement. However, this is assumed not to have an important impact on the analysis in this thesis as the potential for the mistakes is assumed to be the same in both entities.

Moreover, the political economy threat to the internal validity is defined as “endogeneity of policy changes due to governmental responses to variables associated with past or expected future outcomes” (Meyer, 1995, p. 152). This can be assumed away as the decentralization in B&H is attributed to the constitutional setting of the country; no changes were made since the creation of the health care sector of the country.

Similarly, the selection to treatment and control (see section 2.3) shows that the problem of “assignment of observations to treatment groups in a manner that leads to correlation between assignment and outcomes in the absence of treatment” (Meyer, 1995, p. 153) may be assumed away. Also, the framework minimizes the attrition problem, defined as “the differential loss of respondents from treatment and comparison groups” (Meyer, 1995, p. 153) as the decentralization treats everyone in the FB&H and nobody in the RS. It is assumed that nobody will change the entity solely because of the health care system, especially because of the historical factors that limit the inter-entity migration.

In addition to the internal threats to validity presented above, there are also the threats to **external validity** that limit the generalization of the results found in a study to “different individuals, contexts, and outcomes” (Meyer, 1995, p. 153). Overall, the external validity of the results in the framework used in this thesis is very low. The most important reason for the low external validity is the size of the two entities. The optimal size of fiscal units is an open debate. As seen in chapter one, some scholars argue that smaller units are more efficient, whereas the others claim that there are limits to how small can an unit be to be effective. Nevertheless, the conclusions reached for B&H, with a total population of less than four million, should not be generalized to a country with a significantly higher population. Therefore, the results are representative solely for the B&H framework.

2.3: Exogenous Source of Variation in Treatment Assignment

The previous two sections of the Chapter 2 have identified the ‘natural experiment’ as the method this thesis will use to assess the decentralization in the health care, and have showed the limitations of the selected method. Sections three and four will justify the identification of the ‘natural experiment’ in the B&H framework.

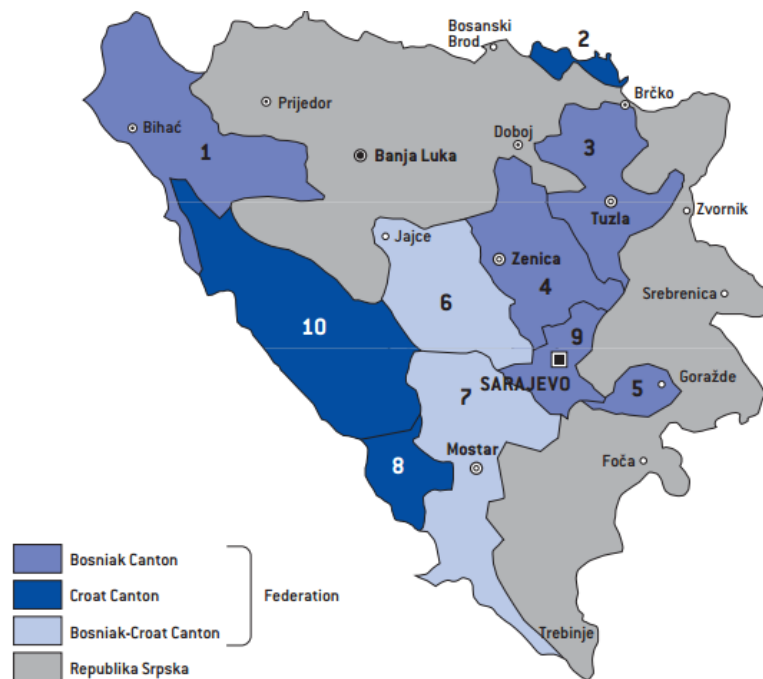
The constitution of Bosnia and Herzegovina dates from the “**general framework agreement for peace in Bosnia and Herzegovina**” signed in the Dayton, Ohio on November 21, 1995 (Dayton Peace Accords, 1995). The aim of the agreement was to end the four-year war in B&H that started with the breakup of the Socialist Federalist Republic of Yugoslavia, and which caused economic devastation and enormous human losses. According to estimates from Research and Documentation Center in Sarajevo (2007, in The Center for Justice & Accountability), the total number of the human casualties of the 92-95 war in Bosnia and Herzegovina is around 100,000. Dayton Peace Accords (1995, p. 8) was signed by the three warring parties (the Republic of Bosnia and Herzegovina, Republic of Croatia and Federal Republic of Yugoslavia) who agreed “to establish a durable cessation of hostilities”.

In the language of diplomacy, “the Parties welcome and endorse the arrangements that have been made concerning the boundary demarcation between the two Entities” (Dayton Peace Accords, 1995, p. 3). Annex 2 of the Accords details the agreement on inter-entity boundary line and related issues. The **inter-entity boundary line** is shown in Picture 2.1. As seen, the country is split to two entities: the Federation of Bosnia and Herzegovina (FB&H) with predominantly

Bosniak¹ and Croatian population (colored in blue), and the Republic of Srpska (RS) with majority Serbian population (colored in grey).

The constitution of the Federation dates even earlier than the B&H constitution. On March 30, 1994, Bosniaks and Croats created new internal territorial establishment within B&H. Article I and II of the Constitution of Federation of Bosnia and Herzegovina (1994) asserts that the entity is composed of smaller federal units – **the cantons**, which all have equal rights and responsibilities. The internal subdivision to ten cantons within the Federation is also seen in the Picture 2.1 (different shades of blue color).

Picture 2.1: Inter-entity boundary line in Bosnia and Herzegovina



Source: UNESCO (2006)

¹ Bosniaks usually refer to the citizens of Bosnia and Herzegovina whose religion is Islam.

In line with the two constitutions, “there is no national mandate for health care financing and provision” (Cain, et.al. 2002, p. 20) in B&H; thus, there are **two health care systems** within the country. “The health care finance, management, organization and provision in Bosnia and Herzegovina are the responsibility of each entity.” (Cain et.al. 2002, p. 19) In the Republic, the health care system is centralized, while in the Federation, the system is decentralized “with each of the ten cantonal administrations having responsibility for the provision of primary and secondary health care through its own ministry” (Cain et.al. 2002, p.19).

Therefore, the constitutional separation of B&H is the external source of variation in the assignment to the treatment of the Federation (with decentralized health care sector) to the treatment group and the Republic (with centralized health care sector) to the control group. In addition to the identifiable external source of variation, to observe if the control is indeed a good counterfactual, the two entities must be comparable along many dimensions. Therefore, to justify the framework used in this analysis, the following section compares and contrasts the two entities.

2.4: The Counterfactual

A ‘natural experiment’ requires a good counterfactual, which provides for an answer to how those who are treated would have fared in the absence of a program (Duflo & Kremer, 2005, p. 205). In order to assess if the centralized health care system in the RS is a good counterfactual to the decentralized health system in the FB&H, the two entities must have similar values of the variables that could potentially affect the health care outcomes. Table 2.1 shows the similarities of the two entities with regards to the demographics, employment, overall economic activity and education.

The public health care systems in both FB&H and the RS are financed by the **mandatory payroll contributions**, meaning that the finance is collected as a percentage of the employees' salaries (Cain, et.al. 2002, pp .41-42). This social health insurance mechanism implies that (a) "social insurance is compulsory", (b) "social insurance premiums usually represent a social compact", and (c) "social insurance contributions are earmarked and segregated from general revenues and expenditures" (World Bank, 2011b).

According to the Institute for Statistics of Federation of Bosnia and Herzegovina (2014) and the Institute for Statistics of Republic of Srpska (2014), total enumerated persons amounted to 2.3 million in the FB&H, and to 1.4 million in the RS. The differing population is not an important limitation for the analysis in this thesis, as all variables are standardized from the absolute number to data per population (or alternatively per 1,000 population). Table 2.1 compares the general demographic indicators for the two entities. The table shows that the **population structure**, with regards to the gender and age, in the Federation and the Republic is highly similar.

Furthermore, as mentioned, the health care system in B&H is financed through salary contributions. Therefore, for the RS to be judged as the good counterfactual, the employment characteristics of the two entities must be similar. The **employment data** presented in the Table 2.1 proves that the two entities are highly comparable with regards to the activity, employment and unemployment rates, as well as the average gross salaries. Also, the table shows that the RS is a good counterfactual to the FB&H in terms of the **overall economic activity** as GDP per capita and GDP growth rates data are highly similar.

To assess the RS as a counterfactual in the health care analysis presented in this thesis, it is also highly important that the two entities are comparable in terms of the education, as a strong

relationship between the **education** and health is well researched and documented. For example, Grossman (1975, in Fucks, 1980, p.2) found a statistically significant effect of the schooling on health, and found that the effect is significant even at the higher level of education. The elementary education in both entities in B&H lasts nine years, and according to the Law on Primary and Secondary Education (2003), is obligatory for all children aged six to fifteen. Therefore, the two entities do not differ with regards to the elementary school enrollment.

Table 2.1 shows that the number of pupils who finished secondary school, and who are enrolled in the institutions of higher education is highly similar in the two entities. It is possible to compare the data standardized to the per 1,000 population measure as the age structure of population in the two entities is highly similar. Also, even though data on students completing the higher education would be better, for the simplicity of comparison the number of enrolled students is a good indicator for the purposes of this thesis. There are many inter-sectorial differences within a higher education, but the differences hold within both entities. Overall, analysis of education in B&H is a separate and wide issue, and is not a subject of this thesis. Therefore, the presented data serves the sole purpose of indicating that the two entities seem to be highly comparable in terms of the educational level attained by the population.

Table 2.1: Demographics, employment, economic activity, and education in B&H entities

2013*	Population	Male	Female	Persons younger than 15	Persons aged between 15 and 64	Persons older than 64
		As % of total population				
FB&H	2,371,603	49%	51%	15%	69%	16%
RS	1,425,549	49%	51%	14%	66%	20%

2013	Activity rate ²	Employment rate ³	Unemployment rate ⁴	Average gross salary (€)
FB&H	42%	31%	27%	665
RS	47%	34%	27%	684

2013 if not indicated otherwise	GDP per population, current prices, €	Average real GDP growth, 2007-2013	Trade balance ratio
FB&H	3,018	1.8%	56.4%
RS	3,142	1.7%	57.1%

2011-2013**	Completed secondary school, per 1,000 population		Enrolled in higher education institutions, per 1,000 population	
	2011/2012	2012/2013	2011/2012	2012/2013
FB&H	10	11	32	31
RS	9	10	33	31

*The data is presented for the year 2013 for which the latest data is available; the indicated similarities hold for earlier years as well.

**The two academic years are selected as the latest data is available for these two years; the indicated similarities hold for earlier years as well.

Source: Data from Agency for Statistics of Federation of Bosnia and Herzegovina (2014), Agency for Statistics of Republic of Srpska (2014), and Agency for Statistics of Bosnia and Herzegovina (2014)

Moreover, the **monetary system** in B&H is regulated in a form of currency boards at the country level; thus the entities share a common Central Bank, which was established in 1997 to “maintain monetary stability by issuing domestic currency according to the currency board arrangement with full coverage in freely convertible foreign exchange funds under fixed exchange rate 1 KM: 0.51129 EURO” (Central Bank of Bosnia and Herzegovina, 2015).

² Activity rate = $\frac{\text{Labor force}}{\text{Working age population}} \times 100$, Agency for Statistics of Bosnia and Herzegovina (2014, p. 20)

³ Employment rate = $\frac{\text{The employed}}{\text{Working age population}} \times 100$, Agency for Statistics of Bosnia and Herzegovina (2014, p. 20)

⁴ Unemployment rate = $\frac{\text{The unemployed}}{\text{Working age population}} \times 100$, Agency for Statistics of Bosnia and Herzegovina (2014, p. 20)

In addition to the shared monetary system, there are many more fields of social, economic, defense, political, legal, cultural, historical, technological, and other spheres of life that the two entities share; after all, **the two entities are part of the same country**. Any international comparison of two or more health care systems is bound to have many limitations as the countries have vast differences. However, having the two different systems in the same country implies that majority of the limitations found in the international comparisons are minimized.

Overall, the two entities in B&H are not completely identical, but the high resemblance between the two makes the centralized health care system a good counterfactual to the decentralized system. The proceeding section explains and assesses the validity of the variables that will be used to assess the decentralization.

2.5: Response Variables

This chapter has so far identified that the method for assessment of the decentralization in this thesis is the estimation of the ATE in natural experiment environment. It has further justified why this method is appropriate for the comparison of the health care systems in the two entities in B&H. This section will show which variables will be used to assess the decentralization, and will show how these variables are measured.

The decentralization in public health care sector will be assessed according to three broad topics: **health care financing, health of the population, and geographical inequalities in the provision of health care services**. First, analysis of the health care financing focuses on the revenues and expenditures in the health care, which will show which system is more cost efficient. The analysis of the second topic is based on the consumers of the health care system,

and it attempts to indicate which system seems better in delivering the health – the primary goal of the health care sector. The third part will indicate which system is likely to lead to higher regional inequalities in the provision of the health care services.

Most of the analysis is based on the time period from 2009 to 2013 for several reasons. First, to estimate if there is an effect of the decentralization, it is necessary to observe a longer time period to see if the latest year data is simply random or there is a trend. Second, the latest data available for most of the variables is from 2013, so this is the ending year of the observation. Third, in most cases, the data in the five observed years are highly similar; thus, there is no need to observe a longer time period. In some cases, other time periods are used; but the explanations for the change are provided.

Table 2.2 outlines the variables used in the assessment of each of the three topics. The detailed description of the variables, along with the source of the data is shown in Appendix (Table A1). Most of the variables used in this thesis are adapted from the reports containing raw data collected and reported by the public institutions in B&H that are governed by the international statistical standards. Therefore, the sources of data are assumed to be reliable.

Table 2.2: List of the response variables used in the analysis

Health care financing	Health of the population	Inequalities in health care provision
Annual consumer price index	Natality rate	Health care revenue in the FB&H cantons
Health care contribution	Mortality rate	Health care expenditures in the FB&H cantons
Health care revenue per population	Natural growth rate	Health care employees in the FB&H cantons and the RS regions

Health care expenditure per population	Causes of death	Health care visits in the FB&H cantons and the RS regions
Composition of mandatory health insurance expenditures	Infant mortality rate	Hospital beds in the FB&H cantons and the RS regions
Public health care employees	Mortality rates by age group	
Composition of public health care employees	Causes of death by age group	
Visits to emergency and family medicine health care services	Total incidence of diagnosed diseases	
Visits to health care services by women, school and pre-school children	Incidence of diagnosed diseases by group of diseases	
Number of hospital beds		
Beds' occupancy rate		

Overall, Chapter 2 has shown that the method for the analysis of the decentralization in health care in this thesis is the 'natural experiment' environment in Bosnia and Herzegovina. The chapter has shown the limitations of the model, but has also justified why this is a good model. Finally, it outlined the variables that will be used in the proceeding section.

Chapter 3 : Analysis and Results

The previous chapter has outlined the methodology used in this thesis. This chapter will proceed by showing the analysis and the results. It will estimate average treatment effects (ATE) of the health care decentralization in the decentralized entity in B&H by comparing the health care outcomes in the two B&H entities.

The first section will show the estimated effects of the public health care decentralization in the decentralized B&H entity on the health care financing by evaluating the effects on the overall health care prices, contributions, expenditures and capacity. The second section will provide for an estimate of the effect of the decentralization on the health of the population, thorough projection of the effects on the mortality rates of different age groups, as well as on the morbidity rates. Finally, section three will focus on the assessment of the public health care decentralization in terms of the effects on the regional inequalities in the health care provision as evident in the disaggregated data on health financing.

3.1: Health Care Financing

The financing of a health care system refers to the process by which the funds to finance the health care are collected, as well as the process of spending the collected funds. Therefore, the financing includes (a) “how we pay for care”, (b) “who pays for care”, (c) “how transactions between users and providers are handled” and (d) “how much money is spent on the care” (Konver & Knickman, 2011, p. 48). As explained in Chapter 2, the health care system in B&H is characterized by the mandatory social insurance run by the state-owned insurance funds. Therefore, in both entities in B&H (a) the health care system is financed by the mandatory contributions from the salaries, (b) the care is paid by the employed citizens, and (c) the

transactions are made based on the third-party payment principle. However, the fourth part of the financing related to the amount of the money spent on the health care may differ between the two entities. Additionally, how much money is spent is as important as how the money is spent. Therefore, the potential differential between the centralized and decentralized health care systems in regards to these two questions creates an opportunity to gain a deeper insight into the relative performance of the decentralized system.

This section analyses and compares the financing of the public health care systems in the decentralized entity (the FB&H) and the centralized entity (the RS) in terms of the money collected and spent on the health care services provision. The goal of this section is to observe the performance of the decentralized system as compared to the centralized system in terms of the amount of collected revenues, and the structure of the expenditures. The section aims to assess the (de)centralization as a policy with important implications for the financial efficiency in the health care. The hypothesis asserts that the decentralized system is expected to place a higher financial burden on the citizens due to the higher administration costs resulting in the overspending and wasting of the public resources. Therefore, the decentralized system is expected to have higher budget but not better performance.

In order to assess the financial efficiency, this chapter firstly tries to determine if the financial comparison between the two entities is possible in real terms. Therefore, the first part of this chapter observes the inflationary trends of the health care prices in the two entities using the Consumer Price Index (CPI). The proceeding part focuses on assessment of the monetary input in the health care provision by comparing the health care contributions in the two entities; thus, it observes the amount of the revenues collected by the mandatory insurance funds. The third section of the chapter observes and compares the general composition of the health care

expenditures in the FB&H and the RS. The final part of the chapter observes closely the output of the health care contributions by focusing on the three types of the health expenditures: the public health care employment, patient visits, and hospital beds. These three types of spending are considered as proxy measures for the health care capacity, which is an important indicator of the effectiveness of spending the collected health care contributions.

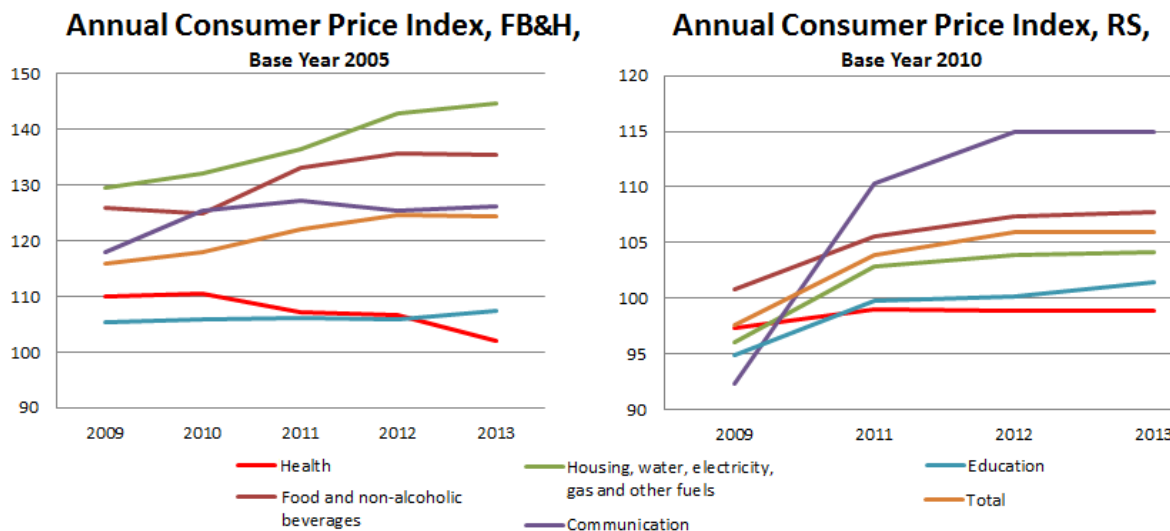
3.1.1: Overall Health Care Prices

In many developed economies, the health care prices rise much higher than the prices of other goods and services, and are “stifling economic growth, consuming increasing portions of the nation’s gross domestic product, and putting added burdens on businesses, the public sector, individuals, and families” (Health Care Cost Institute). If this is the case in B&H, the relatively higher inflation of the health care prices would necessitate the higher financial burden on the employed in order to allow the state-insurance funds to pay for the relatively higher services. It is, therefore, important to observe the overall prices of the health care when assessing the system’s overall financial performance. Additionally, if the relative overall prices for the health care in the two entities differ through time, then the comparison of the revenues and contributions can be made only in nominal, not real terms.

Figure 3.1 shows the prices of health care as compared to the prices of (a) food and nonalcoholic beverages, (b) housing, water, electricity, gas and other fuels, (c) communication, (d) education and (e) overall inflation, during the five-year time period from 2009 to 2013. The graph to the left in the Figure 3.1 shows the annual consumer price index for the selected consumer goods in the FB&H with base year 2005. The graph to the right shows the annual CPI for the RS with 2010 as the base year.

The figure portrays several important conclusions regarding the public health care (de)centralization. First, the left-side graph shows that the annual CPI for the health care is lower than the overall inflation in the Federation. Second, the annual CPI for health care in the Federation is lower than the CPI of the reference goods. Third, in the observed time period, the health care prices are marking a negative trend in the Federation. Similarly, within the same time frame in the Republic, the health care prices are lower than both the average inflation and the price of the selected goods. The prices in the Republic seem to be constant; however, it is important to acknowledge the difference in the base year as in the Republic the base year is within the observed period. Therefore, it cannot be concluded that health care prices have negative trend in the Federation while being constant in the Republic.

Figure 3.1: Annual Consumer Price Index in the FB&H and the RS



Source: Data from Agency for Statistics of Federation of Bosnia and Herzegovina (2014) and Agency for Statistics of Republic of Srpska (2014)

As the base years for the inflation measurement in the two entities differ, it is hard to make a straightforward comparison of the price levels between the two systems. However, by comparing the health care annual CPI within an entity with the CPI for other goods and service within the same entity, it is clearly observed that this price measure does not indicate any significant difference between the decentralized and the centralized health care system. There seem to be no significant average treatment effect of the health care decentralization on the overall prices of the health care system; thus, **the decentralization does not seem to affect the overall health care prices.**

3.1.2: Health Care Contributions

This subsection assesses the health care contributions in the two entities in B&H. To gain an insight into the relationship between the decentralization and the amount of the health care contributions, it is necessary to have a framework of analysis such that the compared regions have, on average, comparable salaries and other employment-related population structure. Chapter 2 of this thesis has demonstrated that the indicated framework of the analysis satisfies these requirements, so the system with the higher rate of contributions should have more funds per population.

The system of the health care contributions is presented in the Table 3.1. In the Federation, employees must contribute 12.5% of their salary to the health care fund, while this contribution is slightly lower in the Republic where it amounts to the 12%. However, the main difference between the entities is that in the Federation employers must pay 4% of employees' wage to the contributions, while there is no such contribution in the Republic. Therefore, total health care contributions in the Federation are 16.5%, while in the Republic they amount to 12%

of the employee wage. Therefore, the contributions for the health care in the decentralized system are higher than the contributions in the centralized system.

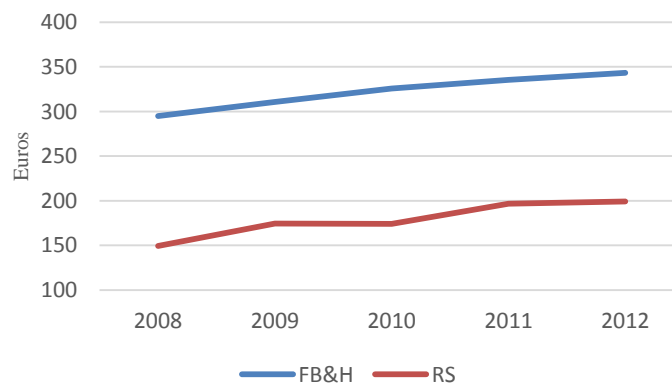
Moreover, Figure 3.2 shows the amount the average citizen paid for the health care contributions in the FB&H and the RS in period from 2008 to 2012. As the contributions in the FB&H are higher while employment statistics are relatively similar to the RS, the health care revenue per population in the FB&H is higher than in the RS. Given the similarities in the external indicators that can affect the average health care revenue per population, it may be concluded that the decentralized system places higher financial burden on the citizens.

Table 3.1: Health care contributions in the FB&H and the RS, % of Salary

	Employee contribution	Employer contribution	Total contribution
FB&H	12.5	4.0	16.5
RS	12.0	0.0	12.0

Source: Foreign Investment Promotion Agency of Bosnia and Herzegovina (2012)

Figure 3.2 Health care revenue, per population*



*Data is for five year period starting from 2008 because the latest data available is for 2012.

Source: Data from Health Insurance Fund of Federation of Bosnia and Herzegovina (2013), Agency for Statistics of Republic of Srpska (2014)

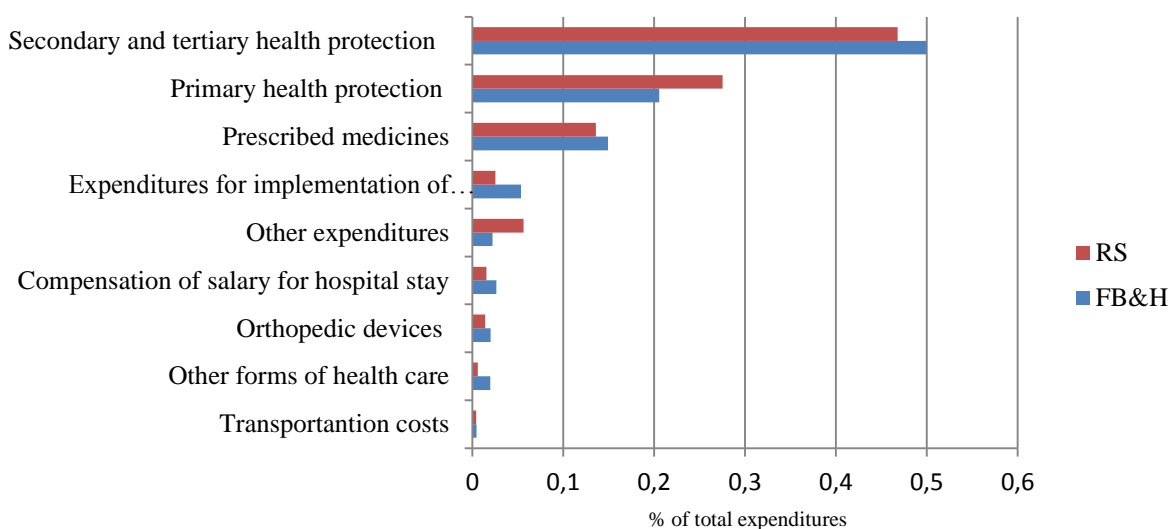
Overall, the average treatment effect of the decentralization on the health care contributions is around 143€. In other words, **citizens in the decentralized system pay more for the health care as compared to the citizens in the centralized system.** The following section will assess the expenditure side of the health care budget to see how is the relatively higher revenues of the decentralized system spent as compared to the centralized system.

3.1.3: Health Care Expenditures

As shown in the previous section, a citizen of the decentralized entity in B&H pays significantly more for the health care than a citizen of the centralized B&H entity. Translated to absolute terms, the health care budget in the Federation is significantly higher than the budget of the Republic. In the system where the per-population revenues are higher, the per-population expenditures will be higher as well. The difference between the expenditure per-population in the FB&H and the RS follows the same trend as the per-population revenues presented in the Figure 3.2 (see Appendix, Figure A1).

As the health care expenditures are much higher in the decentralized system, Figure 3.3 observes the composition of the expenditures aiming to provide for the better understanding of the presented difference. Expenditure is shown as the percentage of the total mandatory health insurance expenditures. As observed, there is no significant divergence among the two entities in regards to the expenditure composition. Most of the mandatory health revenues are spent on primary, secondary and tertiary health protection. The similar composition of the expenditures strengthens the conclusion of the relatively higher financial burden placed on the citizens by the decentralized system.

Figure 3.3: Composition of mandatory health insurance expenditures, 2013



Source: Data from Health Insurance Fund of Federation of Bosnia and Herzegovina (2013) and Health Insurance Fund of Republic of Srpska (2013)

To conclude, there is a positive average treatment effect on the per capita revenues (consequently on per capita expenditures) but no significant ATE on the composition of the expenditures. Therefore, **the decentralized health care system is more costly, but it spends the money in the same way as the centralized entity**. The following section uses measures of the health care capacity to analyze the expenditures of the public health care in more detail.

3.1.4: Capacity of Public Health Care

This chapter has so far shown that the decentralized system is characterized by higher contributions and higher revenues, while the composition of the expenditures is highly similar. This section looks further into the expenditure side of the health care sector, aiming to compare the capacity of the decentralized to the centralized sector. In plain language, capacity refers to the “amount that something can produce” (Oxford Dictionary, 2015a). In line with this plain definition, in this paper the capacity is the amount of the (a) health care employees, (b) patient

visits, and (c) hospital beds the health care sectors can produce. These three measures of spending in health care are proxy variables for the capacity, but given the framework of analysis, explained in Chapter 2, these may be good indicators for the ability of the public health care sector to provide adequate and timely patient care. This subsection is composed of three parts: first assesses data on public health care employees, second deals with the data on patient visits, and third relates to number of hospital beds.

3.1.4.1: Public Health Care Employees

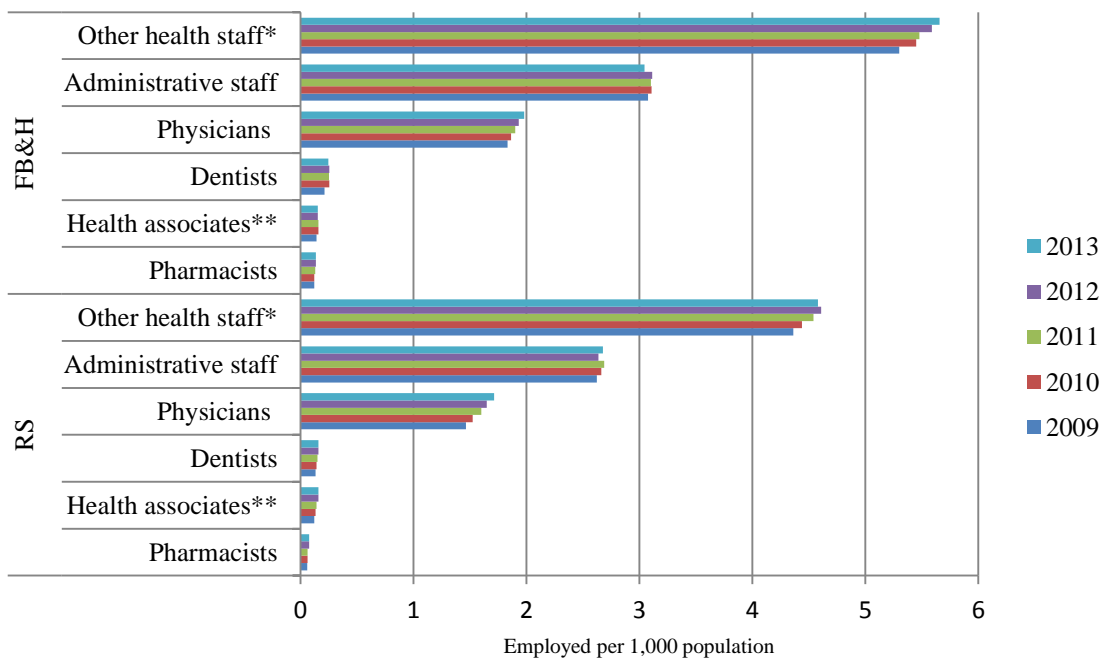
According to the data from the Institutes for Public Health in the FB&H and the RS (see Appendix, Table A2), there are approximately two physicians, and three administrative staff per 1,000 population in both entities. Similarly, there is less than one dentist, pharmacist and health associate⁵ per 1,000 population in both entities. There is the difference of one worker per 1,000 population in the number of other health staff, covering all the employees involved in the direct health service provision but not having university education (for example nurses, health technicians, and midwives). There are approximately six of these workers per 1,000 population in the FB&H, while the number is less than five in the RS. Overall, there was not a lot of difference in the health care sector employment between the two entities in 2013.

To further test the assertion, Figure 3.4 illustrates the five-year trend in the number of the public health care employees adjusted to the population in the two entities. The figure shows that the relative number of the employed in the public health care sector in the two entities did not change significantly as compared to the previously presented observation from 2013.

⁵ Health associates are the health workers with higher education and specialization that perform health services, including psychologists, chemical engineers, and similar (Ze-Do Cantonal Institute for Public Health, NA, p.8).

Moreover, Figure 3.5 shows that the composition of the employees in the public health care institutions in the two entities is highly similar. Almost half of the employees in both entities are medical staff other than physicians. The physicians comprise 18% of the total employment in the public health care in both entities, whereas administrative staff comprises 27-8% of the employed. Therefore, there is no difference in the composition of the public health care employment between the centralized and the decentralized systems.

Figure 3.4: Public health care employees in the FB&H and the RS

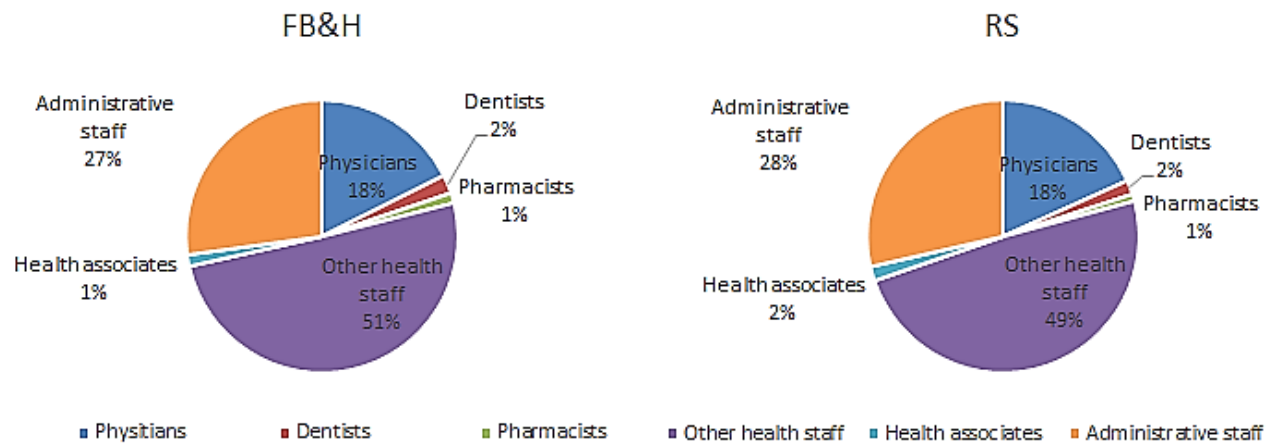


* Other health staff covers all the employees involved in the direct health service provision but not having university education (for example nurses, health technicians, and midwives)

** Health associates are the health workers with higher education and specialization that perform health services, including psychologists, chemical engineers, and similar (Ze-Do Cantonal Institute for Public Health, NA, p.8).

Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Figure 3.5: Composition of public health care employees, as % of total public health care employees, 2013



Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014), Institute for Public Health of Republic of Srpska (2014)

Moreover, even though Chapter 2 demonstrated that the wages in the two entities in B&H are highly similar, for the conclusions in this section to hold true it is also important to observe if the wages in the health care sectors specifically are similar. According to the data from the statistical offices in the FB&H and the RS (see Appendix, Figure A2), the average net wages in the health sectors of the two entities are very similar.

Overall, the presented analysis shows that there seems to be no significant difference in the number and composition of the employees in the public health care sector. The ATE of the decentralization on the number and composition of the public health care employees seems to be zero. Accordingly, this proxy for the capacity of the public health care sector indicates that **decentralized system, even though it places a higher financial burden on the citizens, does not have a higher capacity in terms of the number of the employed in the health care service provision.**

3.1.4.2: Patient Visits to Public Health Care Facilities

In addition to the number of public health care employees, the number of visits to doctors and other medical staff in the public health care can serve as a proxy for the health care capacity. This thesis uses the data with regards to visits to family health care⁶ and emergency. The services are selected based on the data availability; additionally, the two services are highly comprehensive so they generally provide for a good proxy measurement.

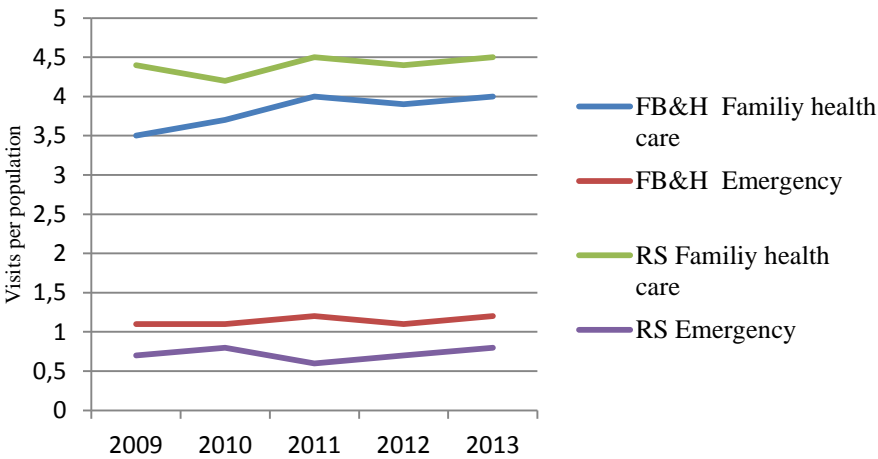
Figure 3.6 shows that the family health care visits are slightly higher in the centralized system, whereas the emergency care visits are slightly higher in the decentralized system. Therefore, it is hard to make any causal conclusion on the effect of the (de)centralization on the health care capacity as measured by the number of visits to family health care and emergency.

Observing groups of patients rather than type of service may provide for a more robust conclusion of the effect of the decentralization. Figure 3.7 shows the visits to public health care facilities of three groups of patients in the two entities: (a) pre-school children, (b) school-aged children, and (c) women. The comparison of the different types of the visits is possible with the proxy of total visits per population due to the similar composition of the population, as seen in Chapter 2. Figure 3.7 indicates that the visits to the health care were higher in the FB&H as compared to the RS constantly throughout the observed period for all three groups of patients. The difference is the highest for women as there are approximately 200 women per 1,000 population in the RS who were visiting health services annually, whereas in the FB&H the number is around 350 per 1,000. Similarly, there was on average 400 pre-school children and

⁶ Family medicine in this thesis refers to the first contact of a patient with public health care facilities, and it serves all members of a household regardless on age, gender or medical issue. (Udruženje doktora porodične medicine Republike Srbije)

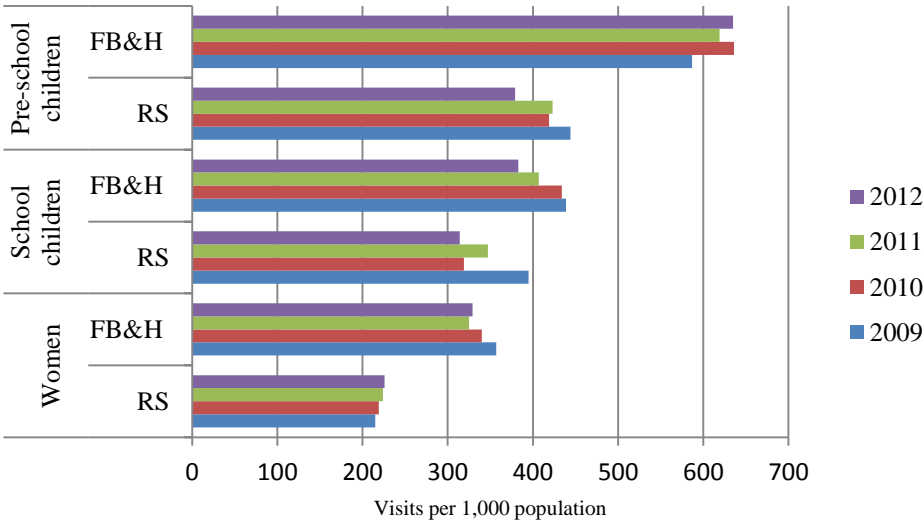
slightly less than 400 school children visits to health care per 1,000 population in the RS annually from 2009 to 2013, while in the FB&H the visits approximated to 600 and 400 per 1,000 population, respectively.

Figure 3.6: Visits to health care services, by type of service



Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Figure 3.7: Visits to health care services, by population groups



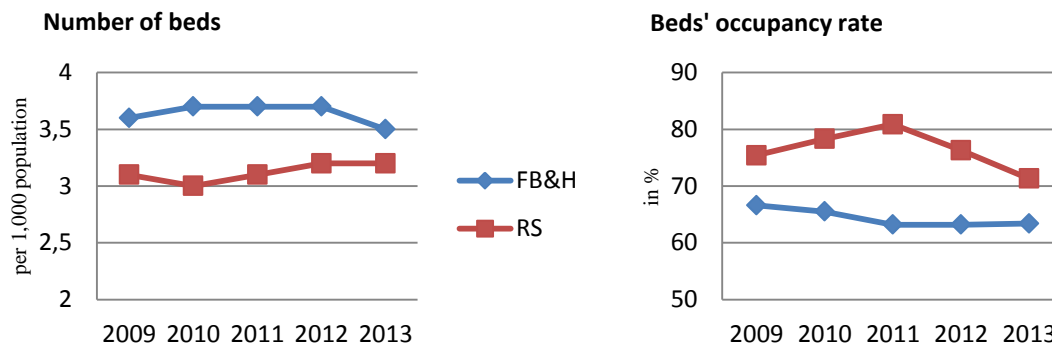
Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Overall, the above findings suggest that patient visits are higher in the decentralized health care system when observing different population groups. However, the findings also suggest that the visits differ according to the type of the service provided. Therefore, **there is no conclusive finding regarding the effect of the health care decentralization on the health capacity as measured by the number of patient visits to public health care facilities.** There is no conclusive estimation of the ATE of the health care decentralization on overall number of patient visits. However, there seem to be positive ATE of the decentralization on number of visits by women, school and pre-school children.

3.1.4.3: Hospital Beds

Finally, the health care capacity can also be approximated with the number of beds in public health care. Figure 3.8 indicates that number of beds as a proxy for the health care capacity is not very different among the two entities. There are slightly more beds in the Federation as compared to the Republic; however, the bed occupancy rate in the Federation is lower than the rate in the Republic. Therefore, **there is no straightforward conclusion on whether the health care capacities in terms of the hospital beds between the decentralized and centralized systems differ.** Overall, there is no convincing estimate of the ATE of the decentralization on the health care capacity as measured by the number of hospital beds.

Figure 3.8: Hospital beds and the beds' occupancy rates



Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

In general, section 3.1 of the chapter three analyzed and compared financing of the health care systems in the FB&H and the RS by observing overall health care prices, health care contribution, health care expenditures, and health care capacity. Based on the presented discussions, **the decentralized system seems to be less financially efficient as it relies on higher contributions while providing no significantly higher quantity of the health care services.**

3.2: Health of the Population

“Better health is of course the *raison d’être* of a health system, and unquestionably its primary or defining goal: if health systems did nothing to protect or improve health there would be no reason for them.” (World Health Organization, 2000, p. 23) Health of the population, therefore, is a good indicator of how good is a health care system. Assessing and comparing population health in the framework presented in the methodology part may show the effects of the decentralization on the health; consequently, the analysis may show if the decentralization is a

better public policy as compared to the decentralization of the health care system. The previous section of Chapter 3 has shown that the decentralized system is less efficient in terms of the financing; this section aims to assess the decentralization in terms of the population health.

Section 2.5 in the methodology description of this thesis showed the limitations of the method used in this thesis. It is further important at this point to briefly mention some broad limitations of measuring health of population. These include failure of people to report sickness as people may be unaware of their health condition, unwillingness to visit the health care sector, small sample size, difficulties in defining health, and difficulties in comparison of different diseases.

The selection of the variables to measure health is highly complicated, which may be attributed already to the starting definition of health, which states that health is “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (World Health Organization, 1948). Obviously, it is rather hard to objectively measure this variable. This thesis assesses health of the population using the rates of mortality and morbidity. Mortality rate refers to “the number of deaths in a given area or period, or from a particular cause” (Oxford Dictionary, 2015b), and morbidity rate to “the frequency with which a disease appears in a population” (Investopedia).

This section will compare the data on mortality and morbidity in the two B&H entities in order to assess the performance of the decentralized health care system in regards to the health of the population. The hypothesis follows the logic of the hypothesis in the section 3.1. Therefore, the expectation is to observe the overall better health of the population in the centralized system due to high bureaucratic costs of the decentralized system that are likely

to cause waste of the public resources. The waste is likely to have a negative effect on the provision of health service and consequently on the health of the population.

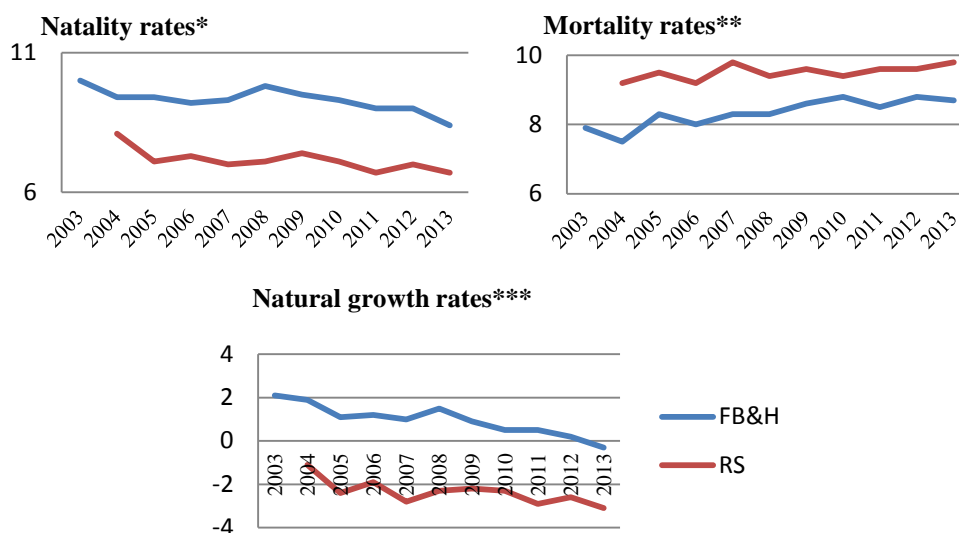
To accomplish the stated goal, the chapter contains four parts. The first part of the section observes the mortality related data in general: it looks at natality, mortality, and population natural growth rates in the two entities. The second part proceeds by assessment of the mortality data for infants, while the third part observes the data for different age groups; namely age groups 1-19, 20-64, and 65+. Finally, the fourth part assesses and compares the data on morbidity for the overall population in the two B&H entities.

3.2.1: Mortality Rates

This subsection compares the data on natality and mortality for the overall population in the two B&H entities. The mortality rate, as mentioned in Chapter 2, is used in the thesis as a proxy for the population health. It is possible to make an inference on the effects of the decentralization by observing these measures for the overall population due to the similarities in the population of the two entities, which are also presented in the second chapter of this thesis.

Figure 3.9 illustrates the data on natality and mortality rates (per 1,000 populations) for the two entities in B&H in the period of the past ten years for which the data is available. As seen in the graph, the natality rate in the FB&H has been constantly above the rate in the RS for the past ten years. Similarly, the mortality rate in the FB&H has been lower than the rate in the RS in the observed time period. In the RS, the natural growth has been consistently negative throughout the period from 2004-2013, indicating the natural population decrease in the RS is a long term problem. In the FB&H, the natural growth was negative only in 2013.

Figure 3.9: Demographic trends in the FB&H and the RS



*Natality rate is the number of live-births per 1,000 population. **Mortality rate is the number of dead per 1,000 population. ***Natural growth rate is natality rate minus mortality rate.

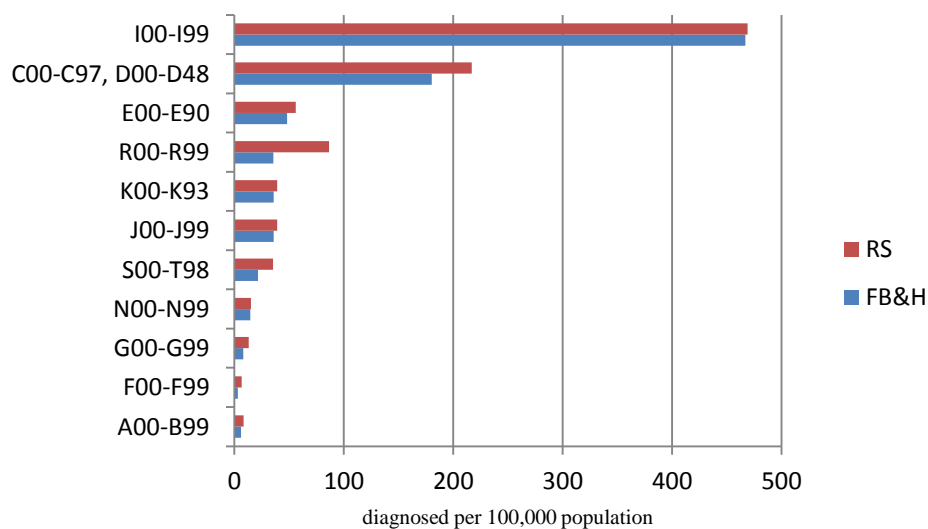
Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

The morbidity rates are assessed based on the grouping of diseases adapted from the international classification of the diseases developed by the World Health Organization (WHO). Table A3 (Appendix) shows the groups of diseases and conditions along with their abbreviations/labels that will be used throughout this chapter when assessing the mortality and morbidity data.

To observe if the higher mortality rate can indeed be attributed to the health care sector, this section proceeds by comparing the leading causes of death in the two entities. Figure 3.10 shows the incidence of death caused by different groups of diseases in 2013 per 100,000 population. The per 100,000 population measure is chosen because of easier interpretation due to the small numbers. As observed, the leading causes of death in both entities were the diseases of the circulatory system. The second leading causes of death are neoplasms, which mostly refer to

different types of cancer. Overall, there seem to be no significant difference in terms of the number of deaths caused by different diseases between the two entities. The mortality data for the previous four years, from 2009-2013, illustrated in Appendix (Figure A3) further supports this conclusion as the data shows the trend of disease related deaths remains the same throughout the observed period.

Figure 3.10: Causes of death in the FB&H and the RS, by type of disease*



*Types of the diseases are defined in Appendix Table A3!

Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014), Institute for Public Health of Republic of Srpska (2014)

Overall, decentralization of health care does not seem to have an effect on the incidence of the types of mortal diseases within a population. Therefore, **according to the data on the causes of death, there seems to be no effect of the decentralization on the health of the population.**

Moreover, even though the mortality rates are higher in the centralized entity, what matters more than the overall mortality rate is the mortality rate of different age groups. When

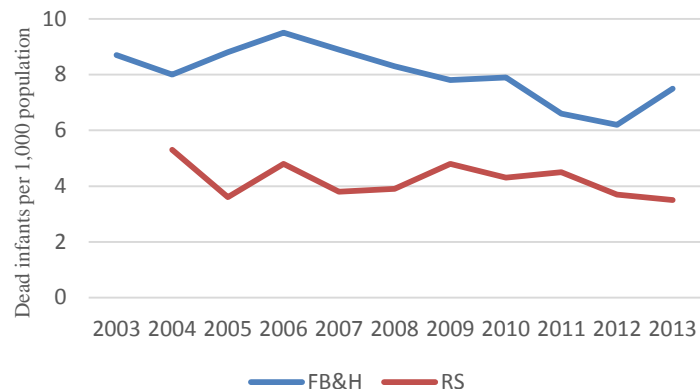
assessing the effectiveness of a health care system, there is a difference if a person dies at age 65+ or at age less than 25. Therefore, the proceeding section looks at the infant mortality data for the two entities to see if there are important divergences between the two entities in terms of the mortality rates of this part of the population.

3.2.2: Infant Mortality Rates

Based on the data from the Institute for Public Health of Federation of Bosnia and Herzegovina (2014), and the Institute for Public Health of Republic of Srpska (2014), 148 and 33 infants (those under the age of one) died in the FB&H and the RS, respectively. This translates to the infant mortality rate, calculated as the infant deaths per 1,000 citizens, of 7.5 in the FB&H and 3.5 in the RS. It is important to note that the difference is not affected by the age of the mothers at the time of giving birth. In both entities, around 84% of the mothers who gave birth in 2013 were between 19 and 34 years old (Institutes for Public Health of the Federation of Bosnia and Herzegovina (2014) and Institutes for Public Health of the Republic of Srpska (2014)).

The rate in the decentralized entity is more than twice the rate in the centralized entity. As the two entities are relatively small samples, it is useful to observe the infant mortality data across the time. Figure 3.11 illustrates the infant mortality rates in the two entities in the period from 2003 (2004 for RS due to data availability) to 2013. The infant mortality rate in the decentralized entity is, on average, twice as big as the infant mortality rate in the RS throughout the period from 2003 to 2013.

Figure 3.11: Infant mortality rates* in the FB&H and the RS



*Infant mortality rate is the number of infant (those below age of one) that die per 1,000 population.

Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Observing the leading causes of the infant deaths during the indicated time period may assist in better understanding of the difference. The five biggest causes of infant deaths in the two entities are (1) Certain conditions originating in the perinatal period, (2) Congenital malformations, deformations, (3) Diseases of the circulatory system, (4) Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified, and (5) Unknown (see Appendix, Table A4).

On average, the absolute number of infants that die due to certain conditions originating in the perinatal period in the Federation is much higher as compared to the equivalent in the Republic. The similar conclusion follows for the congenital malformations and deformations, as well as the diseases of the circulatory system. The differences remain significant when observing relative numbers adjusted for the differing overall population. Finally, it is important to observe that the Federation consistently reports the infant death of unknown origin, whereas there are so such cases reported in the Republic. However, the RS marks relatively higher number of reported

cases of infant deaths caused by symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified.

Overall, **the infant mortality seems to be higher in the decentralized health care system.** Majority of the leading infant mortality diseases are consistently higher in the decentralized health care system. Therefore, on an average, ATE of decentralization on infant deaths seems to be positive as in the decentralized entity annually, on average, four more infants per 1,000 population die as compared to the centralized entity. To further assess this assertion, the following section will look at the other age groups in the population trying to establish a better association between the decentralization and health of the population.

3.2.3: Mortality of Different Age Groups

This section will provide for a deeper insight into the mortality of different age groups, namely 0-19, 20-65 and 65+. The grouping according to age is done in this manner in order to account for differing parts of human life. For convenience of presentation in this thesis, those aged 0 to 19 are characterized as children. Of course, there are differing views on which age classifies as beginning of adulthood; but for the purpose of this analysis, the selected age is 20. Similarly, in this thesis, the population aged 20 to 65 is considered as working-age population, and those above 65 years are senior citizens. It is useful to observe the mortality rates separately for the different age groups as it is a better indicator of the efficiency of the health care sector. To illustrate, if a system has higher relative mortality rate, it may still have highly more efficient health care system it has higher mortality rate for those aged above 65. Therefore, the mortality rate per se is not as important as mortality rate of different age groups. At the end, a health care

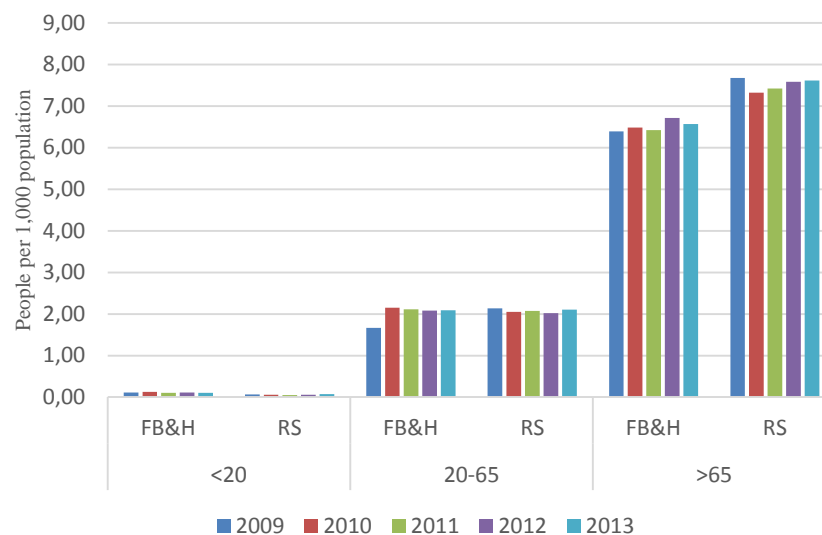
system is better if it cures people effectively to make their lives longer so they eventually die when they are old.

Figure 3.12 shows overall mortality rates for the three population groups. The presented mortality rates are measured as number of people who died in a given year per 1,000 population. It is possible to use the ‘per 1,000’ rather than ‘per number of people in the age group’ due to the similar composition of the population in the two entities, which is presented in Chapter 2 part of the thesis. There is a natural trend in the mortality rates for the three age groups. The lowest mortality is among the youngest and the highest among the oldest.

During the years from 2009-2013, the decentralized entity constantly had higher mortality rates for those under the age of 20 as compared to the rates in the centralized entity. The observation regarding the mortality rates of this age group is not surprising given the conclusions drawn from Figure 3.11. When excluding infants, the mortality rate for the population between 1 and 19 is higher for 2009-2012 in the FB&H; however, in 2013, the mortality rate of this population group is lower in the RS (see Appendix, Figure A4). Therefore, it cannot be concluded that there is a relationship between the (de)centralization in health care and mortality rate of the defined aged group.

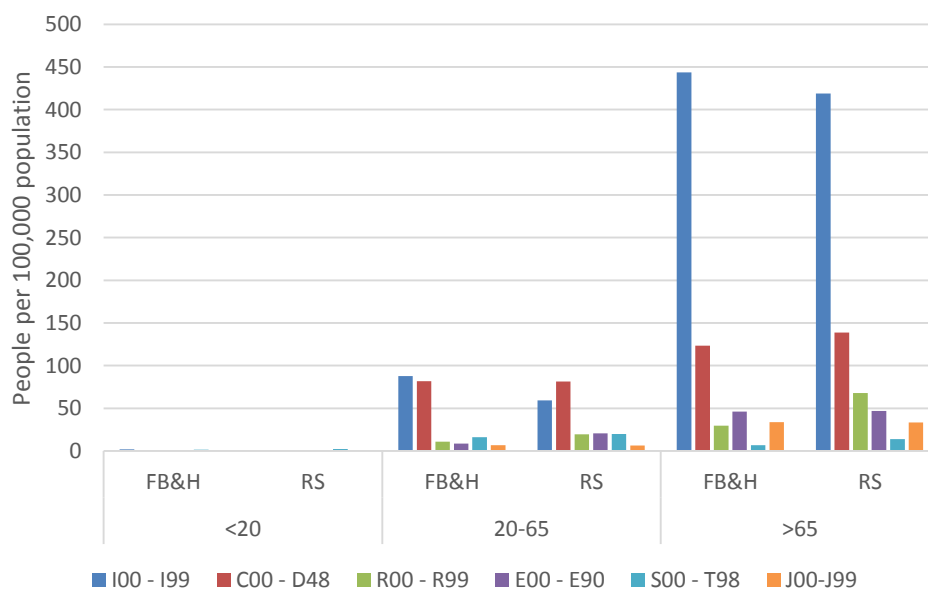
Furthermore, as seen in the Figure 3.12, the mortality rates for those aged 20-65 in the two entities seem to be similar. The highest difference is observed in 2009, but in the remaining four years observed, the difference diminishes. Therefore, there seem to be no significant difference between the decentralized and centralized health care system in terms of health care delivery for the population aged 20 to 65. Moreover, with regards to the senior citizens mortality rate, the mortality rate seems to be consistently higher in the RS as compared to the FB&H. Therefore, the centralized system seems to have higher mortality rate among the senior citizens.

Figure 3.12: Mortality rates by age group in the FB&H and the RS



Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Figure 3.13: Causes of death by age group and type of diseases* in the FB&H and the RS



*Types of the diseases are defined in Appendix Table A3!

Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Moreover, observing the most common causes of death among the different age groups of the two entities may provide us with an even better understanding of the health care provision in the decentralized as compared to the centralized system. As in section 3.2.1 we have seen that the trend of disease related deaths remains the same throughout the period from 2009 to 2013 (Figure A3), an overall conclusion regarding the most important causes of death among the three age groups in the two entities may be reached by observing year 2013.

Figure 3.13 shows the most important cause of death in both entities are the diseases of the circulatory system; and the second most important cause of death are neoplasms. There are also no significant differences between the two entities with regards to the causes of death from the other four major causes of the diseases (symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; endocrine, metabolic and nutritional diseases; injuries poisonings and certain other consequences of external causes; diseases of the respiratory system).

Overall, the section 3.2.1 showed that the mortality rate in the centralized entity is higher as compared to the decentralized entity. Closer analysis of the mortality data in 3.2.2 and this section shows that the higher mortality rate in the RS results from the higher rates in group of population aged 65 and older. On contrary, the infant mortality as well as children mortality is relatively lower in the RS. Therefore, there seems to be **positive effect of the decentralization in the health care on the infant mortality, no effect on the age groups 1-65, and negative effect on the 65+ age group**. Additionally, there seem to be no difference in the causes of death among the citizens in the FB&H and the RS, which confirms the previous conclusion that the ATE of decentralization on causes of deaths is zero.

3.2.4: Morbidity rates

This subsection assesses the morbidity data in the two entities in B&H. Figure 3.14 illustrates the total diagnosed incidence of diseases per 1,000 population in the FB&H and RS in period from 2009 to 2013. Important to note immediately is that the graph illustrates the diagnosed incidence, which is recorded in the statistical offices. The actual disease rate might differ; however, as mentioned, given the similarities outlined in the second chapter of this paper, it may be assumed that the rate of diagnosing diseases in the two entities is similar. Moreover, the numbers presented in the graph can be higher than 1,000 even though the rate of measurement is per 1,000 population due to the fact that one patient can be diagnosed with more than one disease at the same time. Figure 3.14 shows that the total incidence of diagnosed diseases is higher in the decentralized entity throughout the observed time period.

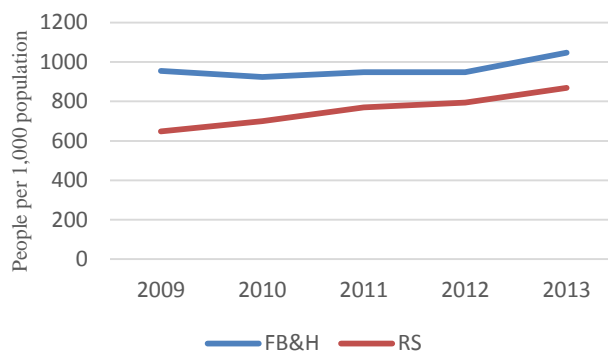
It follows from this observation that the decentralized system seems to have more diagnosed diseases as compared to the centralized system. However, it is hard to make any additional conclusion from this observation. On one hand, higher incidence of diagnosis may mean that the decentralized system is more efficient in diagnosing and curing diseases. However, this potential explanation can be disregarded to a high degree given the analysis in part 3.2.1. On the other hand, the higher incidence may reflect the weaker efficiency in curing diseases in the decentralized system. Clearly, this assertion is problematic due to the fact that some diseases last for a life-time. However, the limitation can be assumed away if the two entities are similar in terms of the type of the diseases that are diagnosed.

Figure 3.15 compares the type of diseases that are diagnosed in the two entities in 2013, per 10,000 population. Most of the diagnosed diseases do not mark significant divergence

between the two entities. The significant difference is observed solely in the diagnosis of the diseases of the respiratory system. The findings from the 2013 also hold for the previous four years (2009-2012) as seen in Appendix (Figure A5). Overall, the difference between the two entities indicated in Figure 3.2.6 seems to result mostly from the difference in the incidence of the diseases related to respiratory system.

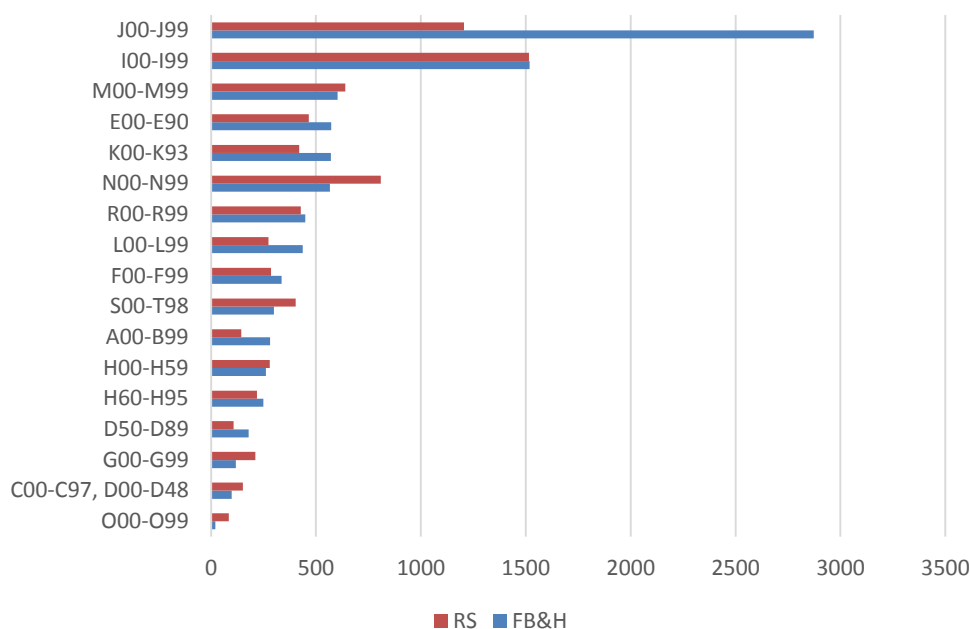
A possible explanation for the high divergence among the two entities in regards to the diagnosed diseases related to the respiratory system may potentially be explained by high number of the patients in couple of regions in the FB&H, which have high air pollution due to coal mining industry. Important to note is that the mortality rates from the diseases of the respiratory system are not different as seen in Figure 3.2.2. Therefore, the decentralized system has higher incidence of the diagnosed respiratory diseases, but no higher mortality from these diseases, which indicates that the system seems to address this issue effectively. However, as the higher incidence of the respiratory diseases is caused by factors external to the health sector; **the effects of decentralization on the population health as measured by the diagnosed diseases cannot be estimated.**

Figure 3.14: Total incidence of diagnosed diseases in the FB&H and the RS



Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Figure 3.15: Incidence of diagnosed diseases by type of diseases* in the FB&H and the RS



*Types of the diseases are defined in Appendix, Table A3!!

Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Overall, this section has shown that there seems to be no ATE of the decentralization on the causes of death, **positive ATE on the infant mortality, no ATE on the mortality of age groups 1-65, negative ATE on mortality rates of the 65+ age group.** Additionally, the ATE of the decentralization on the morbidity rates cannot be estimated.

3.3: Regional Inequalities

Previous two sections of Chapter 3 have assessed the decentralization in the health care system based on the health financing, and on the health of the population. The ideal goal of this section would be also to assess the decentralization according to these parameters, but observing the regional data within the two entities in B&H. As mentioned, the decentralized entity in B&H

is composed of ten cantons. The centralized entity has no cantons, so for the purpose of comparison of the regional data between the two entities, the RS data is disaggregated to the seven regions based on the largest cities in the entity. The goal of the shift in the focus is to see if the decentralization is associated with higher or lower inequality in the provision of the health care services. The inequality occurs if all citizens within an entity are not treated the same regardless of the part of the entities in which they live.

This section will only provide for the analysis of the inequalities in health care finance in decentralized as compared to the centralized system. It is not possible to assess the effects of the decentralization on the inequalities in the health of the population in different cantons/regions and use the findings as indicative of the inequalities in the health provision due to several reasons.

First, there are different types of the health care institutions, and the most advanced ones tend to treat the most complicated health problems indicating that the mortality and morbidity is likely to be higher in these institutions. These institutions are usually located in the capital. Therefore, it cannot be claimed that the infant mortality in Canton Sarajevo is much higher than the infant mortality in another canton if the most complicated problems are dealt with in the specialized health institution in Sarajevo.

Second, it is not possible to use the cantonal and regional data in the FB&H and RS due to different regionalization of the two entities. For example, Banja Luka is the capital of the RS, while Sarajevo is the capital of the FB&H; however, the Banja Luka region makes around 50% of the RS, while Sarajevo comprises less than 20% of the FB&H. Therefore, the cantons in the FB&H are demographically different than the regions in the RS. Second, there is different pattern of regional economic differences within the two entities. For example, salaries in the Banja Luka region are the lowest among the seven RS regions, while the salaries in Kanton Sarajevo are the

highest among the ten FB&H cantons. Third, the cantons and regions are small samples, and it is hard to make an inference about the incidence of the diseases based on several cases.

Overall, the assessment of the decentralization of the health care system in terms of the health provision as measured by the health of the population is not possible due to the mentioned three limitations that completely limit the potential for the causal interpretation of a result based on usage of cantonal and regional data. The potential solution might include only observation of the municipality and the city level data. However, the first limitation still holds as well as the third limitation, which is significantly magnified.

Therefore, **this section will estimate the average treatment effect of the public health care decentralization on the regional inequalities in the health care financing.** The hypothesis is that the decentralized system leads to higher inequalities in the provision of the health care services. To achieve the stated goal, this section of the chapter there is composed of the two subsections. The first observes the inequalities relating to the health care revenues and expenditures in the two systems simply by observing the data from the cantons in the FB&H, for the reasons that will be explained in this subsection. The second subsection will then analyze and compare the inequalities in the health care capacity, by observing the cantonal data in the FB&H and the regional data in the RS. The reasoning suggesting why the cantonal-regional comparison could be valid for this analysis is outlined in the second subsection.

3.3.1: Health Care Revenues and Expenditures

This subsection will show the regional revenue patterns in the two entities. This assessment is based on the data regarding average salaries in the ten cantons in the decentralized entity in B&H. If there are significant discrepancies in the average gross salaries and employment

rates between the cantons, it means that there is higher inequality in the decentralized system, regardless on the average salaries in the RS. The most important reason that supports this claim is the fact that the system in B&H is based on employment contributions, which implies that if a canton has higher gross wages the health care revenue will be higher, and vice versa. On the other hand, the centralized system has a common fund meaning that the revenue is collected centrally and cannot be valued on the regional basis.

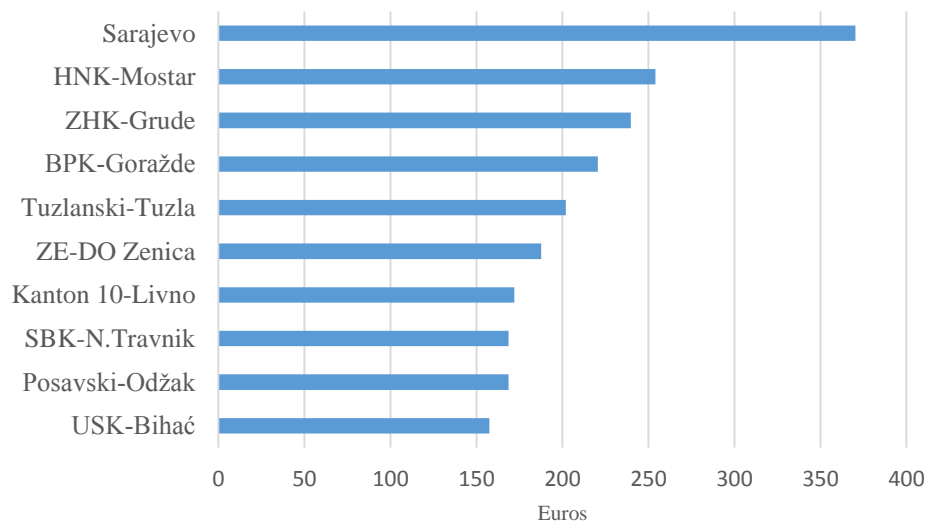
Note that this part only focuses on revenue side of the budget, and the proceeding section will look at the inequalities in expenditures. This is the starting point of the inequality analysis. This point is based on the assumption that the decentralized system is inherently more unequal in a country with large regional disparities as the revenues in different regions differ considerably. Of course, as will be indicated in the following part, what also matters is how equally the centralized system distributes the collected revenues.

An equally important note to understand before the actual data analysis is that the inequality in the amount of financing available presented in this subsection is caused by the decentralization, but the inequality in wages is observed due to regional economic differences thus not caused by the decentralization. In other words, **the regional economic differences cause the differences in wages, and these differences are transferred to the health care sector due to the decentralization.**

Figure 3.16 illustrates how the decentralized system in the FB&H transfers the regional economic inequalities to the health care sector. The figure shows that per population revenue in the ten cantons is not equal. The health care system has, on an average, slightly over 350€ to spend on a person in the Sarajevo Canton, while in the Unsko-Sanski Canton, and average citizen is entitled to slightly over 150€ for the health care services. Clearly, there are huge discrepancies

within the FB&H in terms of the revenues collected for the health care. This assertion is also supported by the expenditure data (Appendix, Figure A6), which shows that the expenditures are highly different. Consequently, an average citizen in one canton does not receive the same health care service as an average citizen in another canton.

Figure 3.16: Health care revenues per population in 10 Cantons in the FB&H



Source: Data from Health Insurance Fund of Federation of Bosnia and Herzegovina (2013)

Overall, **the decentralization in the FB&H increases regional inequalities in the provision of the public health care services concerning the amount of revenues (and expenditures) per population.** The standard deviation of the revenues in the FB&H cantons is 60€. Therefore, in the FB&H, on an average, the annual ATE of the decentralization on inequalities in the amount of revenue collected per population is 60€.

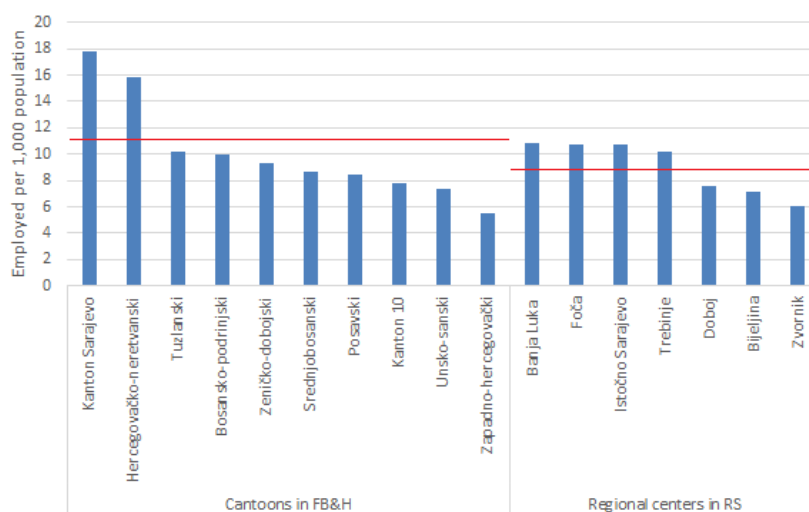
3.3.2: Health Care Capacity

This section will continue with the assessment of the decentralization of the public health care system in terms of the inequalities in the health care financing. However, finding in this section are highly limited by the differences between the inter-entity regionalization. It observes the expenditure patterns in the ten cantons in the FB&H and the seven regions in the RS using the proxy of health care capacity, as defined in the section 3.1. The section 3.1 of this thesis also showed that the number of employed, visits and beds in the health care in the two entities did not fluctuate significantly within the period from 2009 to 2013. Thus, the conclusions may be made through sole observation of one year.

Figure 3.17 shows the total employed per 1,000 population in the health care sector in the cantons/regions of the two entities in 2013. The red lines show the average number of employed in the health care sector in the whole FB&H and the RS. The illustration shows that there are difference in the numbers in both entities. In fact, the standard deviation of the number of employed in the ten cantons in the FB&H is 3.6, and of the same variable in the seven regions in the RS 1.8. Therefore, the fluctuations are twice as high in the decentralized system indicating that there is higher inequality among the cantons in the FB&H as compared to the regions in the RS. Furthermore, the number of patient visits to the health care can also serve as a proxy for the health care capacity. Figure 3.18 shows the average number of total visits to the health care in the ten cantons in the FB&H and the seven regions in the RS in 2013. The blue lines show the averages for the entities. The standard deviation for this proxy variable in the FB&H is 3.5 and in the RS is 0.5. Clearly, the inequality in terms of the total patient visits is much higher within the decentralized system.

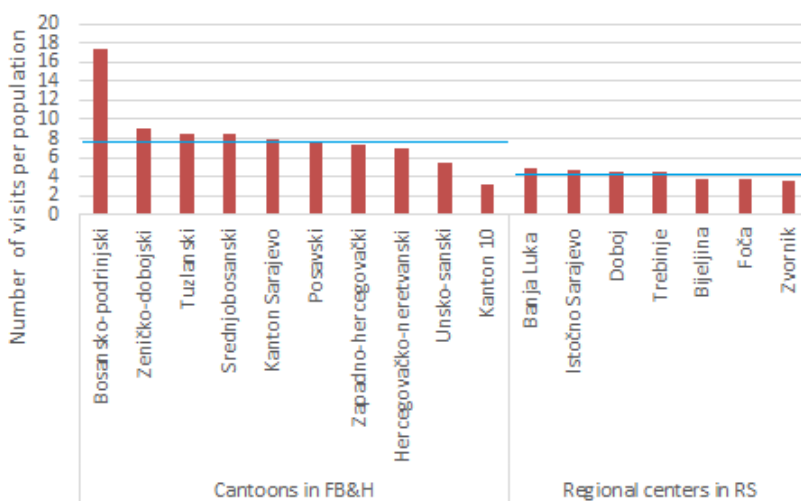
Finally, the number of beds in the cantons/regions does not indicate that the decentralization leads to the higher inequality. On an average, the standard deviation for the ten FB&H cantons is 1.5 and for the RS regions is 1.4 (see Appendix, Table A5).

Figure 3.17: Public health care employees in the FB&H Cantons and the RS Regions, 2013



Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014), Institute for Public Health of Republic of Srpska (2014)

Figure 3.18: Visits to health care sector in the FB&H cantons and the RS regions, 2013



Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Overall, this analysis has shown that the decentralized system seems to lead to the higher geographical inequalities in the provision of the health care services as measured by the health care capacity. It means that the health care capacity is marked by higher divergences within the decentralized system. On an average, the difference in the patient treatment is more unequal among the regions in the decentralized health system as the regions are marked by high differences in terms of public health care employees and patient visits. No significant difference among the centralized and decentralized system in terms of the number of beds in the health system are observed. Nevertheless, these are just indications of potential inequalities as the **effects of decentralization on regional inequalities in health care capacities cannot be estimated** due to prominent limitations posed by the different regionalization within the FB&H as compared to the RS regionalization.

In general, Chapter 3 has analyzed the data and presented the findings with regards to the effects of the health care decentralization on the health care financing, health of the population and geographical inequalities in the provision of health care services in the two entities in Bosnia and Herzegovina. These are summarized in the proceeding part of the thesis.

Conclusion

This thesis assesses public health care decentralization in ‘natural experiment’ environment by estimating the average treatment effect of the decentralization on health care financing, health of the population, and the regional inequalities in the health care provision. The framework for the analysis are the two entities within Bosnia and Herzegovina (B&H). One entity is the Federation of Bosnia and Herzegovina (FB&H), which is comprised of ten federal units (cantons). In accordance, the Federation has a decentralized health care system, and as such is the treatment group in this thesis analysis. The second entity in B&H is the Republic of Srpska (RS). The health care sector in this entity is centralized, and in this analysis serves as a counterfactual to the decentralized health system in the Federation.

A ‘natural experiment’ must be justified by the existence of the exogenous source of variation in the treatment assignment, and by the existence of similarities in the relevant characteristics between the treatment and control groups. The external source of the variation in the indicated framework in B&H is the constitutional separation of the country into two administrative and political entities. This separation dates from the Dayton Peace Accords in 1995 that ended the four-year war in B&H. The separation was a compromise the warring parties made to end the bloodshed and devastations. Therefore, the health care sector in the Federation is not decentralized for the reasons that are relevant for the health care; similarly, the centralized health sector in the Republic is not the product of economic considerations important for the health care sector. Rather, the health care decentralization in the Federation and centralization in the Republic were a sole result of political and military considerations. Furthermore, the centralized health system in the Republic is a good counterfactual to the decentralized system in the Federation as the two entities are similar in most of the characteristics that can potentially

affect the health care outcomes. The entities are highly similar in the majority of economic, social, cultural, technological, and historical aspects; after all, the two are part of the same country. Therefore, it may be assumed that the health outcomes in the Federation would be the same as the outcomes in the Republic, had the system in Federation not been decentralized.

In general, this thesis has found that the decentralization in public health care is associated with higher financial inefficiency, poorer health of population, and higher regional inequalities in the health care service provision. The findings are summarized below:

Health Care Financing

Overall Health Care Prices	Centralized and decentralized health systems have the same level of overall health care prices.	
Health Care Contributions	Decentralized health system requires more financial contributions from the citizens.	
Health Care Expenditures	Centralized and decentralized health systems have the same composition of the health care expenditures.	
Capacity of Public Health Care	Health Care Employees	Centralized and decentralized health systems have the same capacity in terms of the number of the employed in the health care service provision.
	Health care visits	Centralized and decentralized health systems do not seem to be different with regards to the number of patient visits.
	Hospital beds	Centralized and decentralized health systems do not seem to be different with regards to the hospital beds.

Health of the population

Mortality Rates	Centralized and decentralized health systems do not seem to be different with regards to the causes of death of the population.	
Infant Mortality	Decentralized health system has higher infant mortality.	
Mortality of Different Age Groups	Centralized and decentralized health systems do not differ according to mortality rates of the age group 1-65. Centralized health system has higher mortality rate of the 65+ age group.	
Morbidity Rates	The effects of decentralization on the population health as measured by the diagnosed diseases cannot be estimated.	

Regional Inequalities

Health Care Revenues and Expenditures	Decentralized health system leads to higher regional inequalities in the provision of the public health care services concerning the amount of revenues (and expenditures) per population.
Health Care Capacity	The effects of decentralization on regional inequalities in health care capacities cannot be accurately estimated; but there is an indication of the negative relationship between the decentralization and the regional equality in the provision of health services as measured by the health care capacity.

The internal validity of the presented conclusions is limited by several factors. First, even though the indicated framework assumes no differences between the two entities, there still may be some omitted variables that can limit the causal interpretation of the findings. These may refer to potentially different collaboration of the health institutions in the two entities with health institutions abroad. Second, the samples are relatively small, so the conclusiveness of the findings may be questionable even with the observation of longer time period. Third, there are possibilities of mistakes in the data recording and reporting. The external validity of the analysis is low mostly due to the size of B&H. The conclusions may be completely opposite for units that are much larger in population than the two entities in B&H.

As the literature that assesses the health care decentralization in the Federation of Bosnia and Herzegovina is quite limited, more research on this topic is encouraged. Nevertheless, the findings have important policy implication for the health care authorities in the Federation. **The Federation of Bosnia and Herzegovina should gradually move towards the centralized health care system.** This would allow for a higher financial efficiency, in addition to a better and more equal delivery of the health care services.

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Appendix

Table A1: Summary of the response variables used for the analysis in this thesis

Name of the variable	Definition	Source of data	Data collection
SECTION 1: Health Care Financing			
Annual consumer price index	‘Measure of average price changes of product (goods and services) which consumers buy for their personal needs’ (FB&H Agency for Statistics, 2014A, p. 126)	Agency for Statistics of Federation of Bosnia and Herzegovina, and of Republic of Srpska	<i>See Agency for Statistics of Federation of Bosnia and Herzegovina (2014, p. 125) And Agency for Statistics of Republic of Srpska (2014, p. 20)</i>
Health care contribution	The percentage of employee salary paid for the mandatory state health insurance.	Foreign Investment Promotion Agency of Bosnia and Herzegovina	<i>Law on health contributions in the FB&H and the RS</i>
Health care revenue per population	Total collected annual revenues divided by the population.	Health Insurance Fund of Federation of Bosnia and Herzegovina, and Agency for Statistics of Republic of Srpska	<i>Revenue and expenditure transactions from the Insurance Funds</i>
Health care expenditure per population	Total health care expenditures divided by the population.	Health Insurance Fund of Federation of Bosnia and Herzegovina, and Agency for Statistics of Republic of Srpska	<i>Revenue and expenditure transactions from the Insurance Funds</i>
Composition of mandatory health	Each health care expenditure item as percentage of the total health care	Health Insurance Funds of Federation of Bosnia and	<i>Revenue and expenditure transactions from</i>

insurance expenditures	expenditures,	Herzegovina and Republic of Srpska	<i>the Insurance Funds</i>
Public health care employees	Total number of all employees in the public health care sector.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Composition of public health care employees	Type of employee (physician, dentist, pharmacist, administrative, associates, other) as a percentage of total employees.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Visits to emergency and family medicine health care services	Total number of patient visits to two public health care services: family medicine and emergency.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Visits to health care services by women, school and pre-school children	Total number of visits to public health care services by women, school and pre-school children.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Number of hospital beds	Total beds available in the institutions for public health care.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Beds' occupancy rate	The percentage of beds occupied by patients, on an average.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>

SECTION 2: Health of Population

Natality rate	Number of livebirths per 1,000 population.	Institute for Public Health of Federation	<i>Public health care institutions'</i>
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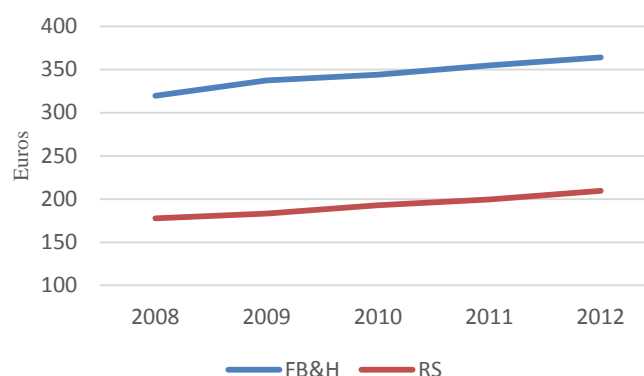
		of Bosnia and Herzegovina and Republic of Srpska	<i>registers</i>
Mortality rate	Number of deaths per 1,000 population.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Natural growth rate	Natality rate minus mortality rate.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Causes of death	Number of deaths caused by a defined group of disease (classification in Table A3 in Appendix).	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Infant mortality rate	Number of infants (those below age of one) that died during a year per 1,000 population.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Mortality rates by age group	Number of people within a defined age group (0-19, 20-64, 65+) per 1,000 population who died in a given year.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Causes of death by age group	Number of deaths within a defined age group caused by a defined group of disease (classification in Table 2.3).	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Total incidence of diagnosed diseases	Total number of diseases that were diagnosed in a population within a year.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Incidence of diagnosed	Number of annually diagnosed diseases by the	Institute for Public Health of Federation	<i>Public health care institutions'</i>

diseases by group of diseases	defined group of diseases in the population.	of Bosnia and Herzegovina and Republic of Srpska	<i>registers</i>
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SECTION 3: Regional Inequalities

Health care revenue in the FB&H cantons	Health care revenues per population collected in each of the ten cantons in the FB&H.	Health Insurance Fund of Federation of Bosnia and Herzegovina	<i>Internal transaction records from the cantonal public insurance funds</i>
Health care expenditures in FB&H cantons	Health care expenditures per population collected in each of the ten cantons in the FB&H.	Health Insurance Fund of Federation of Bosnia and Herzegovina	<i>Internal transaction records from cantonal insurance funds</i>
Health care employees in the FB&H cantons and the RS regions	Health care employees per 1,000 population employed in the ten FB&H cantons and seven RS regions.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Health care visits in FB&H cantons and RS regions	Patient visits to health care services per 1,000 population in the ten FB&H cantons and seven RS regions.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>
Hospital beds in FB&H cantons and RS regions	Hospital beds available in the public health care sector per 1,000 population in FB&H cantons and RS regions.	Institute for Public Health of Federation of Bosnia and Herzegovina and Republic of Srpska	<i>Public health care institutions' registers</i>

Figure A1: Health care expenditures in the FB&H and the RS



*Data is for five year period starting from 2008 because the latest data available is for 2012.

Source: Data from Health Insurance Fund of Federation of Bosnia and Herzegovina (2013), Agency for Statistics of Republic of Srpska (2014)

Table A2: Public health care employees in the FB&H and the RS, 2013

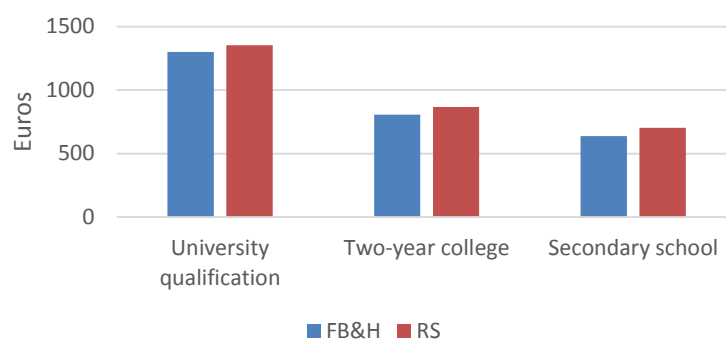
Numbers per 1,000 Population						
	Physicians	Dentists	Pharmacists	Other health staff*	Health associates**	Administrative staff
FB&H	2.0	0.2	0.1	5.7	0.2	3.2
RS	1.7	0.2	0.1	4.6	0.2	2.7

* Other health staff covers all the employees involved in the direct health service provision but not having university education (for example nurses, health technicians, and midwives)

** Health associates are the health workers with higher education and specialization that perform health services, including psychologists, chemical engineers, and similar (Ze-Do Cantonal Institute for Public Health, NA).

Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014), Institute for Public Health of Republic of Srpska (2014)

Figure A2: Average monthly gross wages in public health care sectors in the FB&H and the RS, 2013



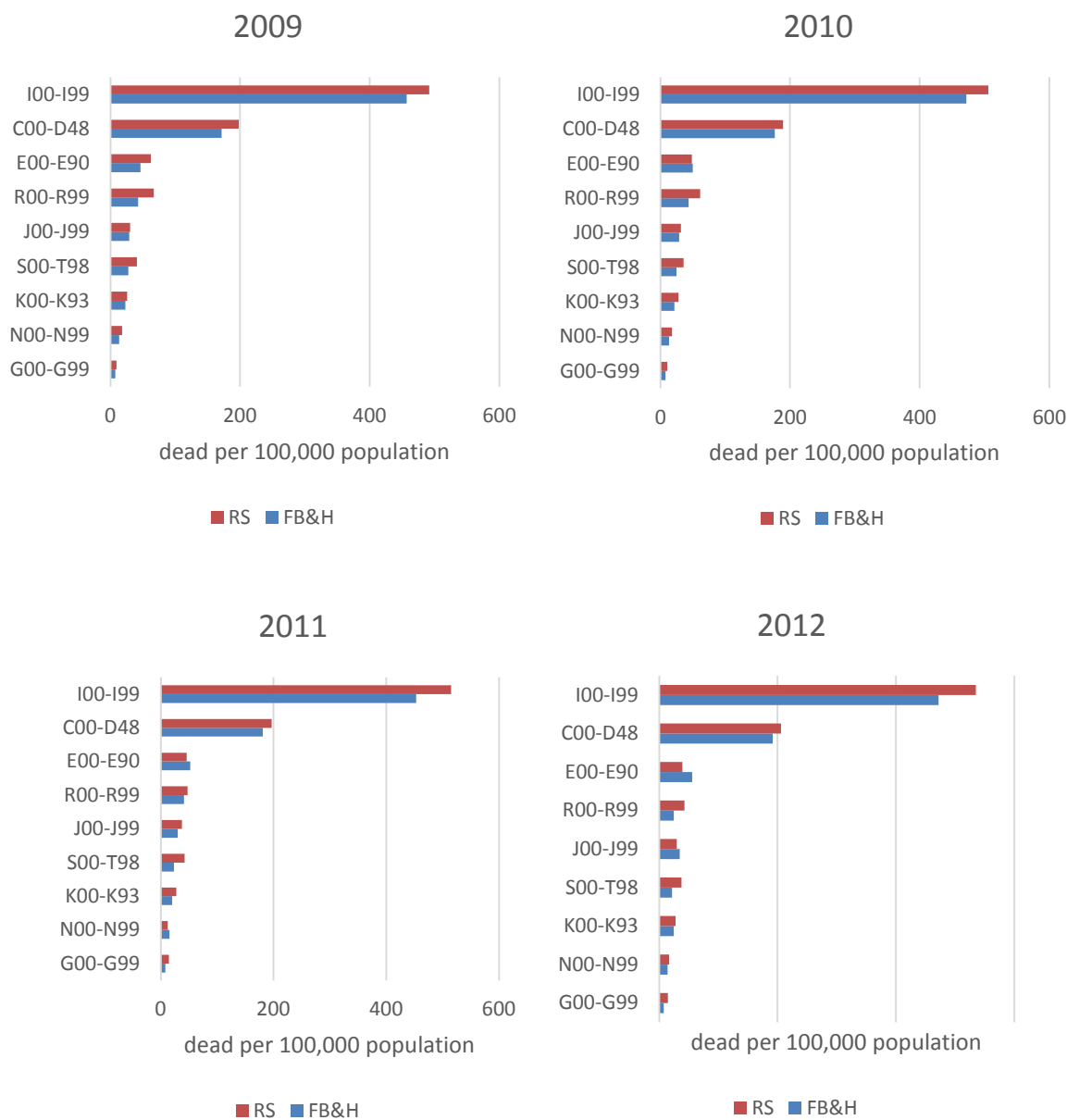
Source: Data from Agency for Statistics of Bosnia and Herzegovina (2013), Agency for Statistics of Republic of Srpska (2014)

Table A3: Classification of the diseases and conditions, WHO

Symbol	Disease
A00-B99	Infectious and parasitic diseases
C00-C97, D00-D48	Neoplasms
D50-D89	Diseases of the blood and blood-forming organs, disorder involving the immune mechanism
E00-E90	Endocrine, metabolic and nutritional diseases
F00-F99	Mental and behavioural disorders
G00-G99	Diseases of the nervous system
H00-H59	Diseases of the eye and adnexa
H60-H95	Diseases of the ear and mastoid process
I00-I99	Diseases of the circulatory system
J00-J99	Diseases of the respiratory system
K00-K93	Diseases of the digestive system
L00-L99	Diseases of the skin and subcutaneous tissue
M00-M99	Diseases of the musculoskeletal system and connective tissue
N00-N99	Diseases of the genitourinary system
O00-O99	Pregnancy, childbirth and the puerperium
P00-P96	Certain conditions originating in the perinatal period
Q00-Q99	Congenital malformations, deformations
R00-R99	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified
S00-T98	Injuries poisonings and certain other consequences of external causes
Z00-Z99	Factors influencing health status and contact with health services
999	Unknown

Source: Institute for Public Health of Federation of Bosnia and Herzegovina (2014)

Figure A3: Causes of death in the FB&H and the RS, by type of disease*



*The classification of the diseases is shown in Appendix, Table A3!

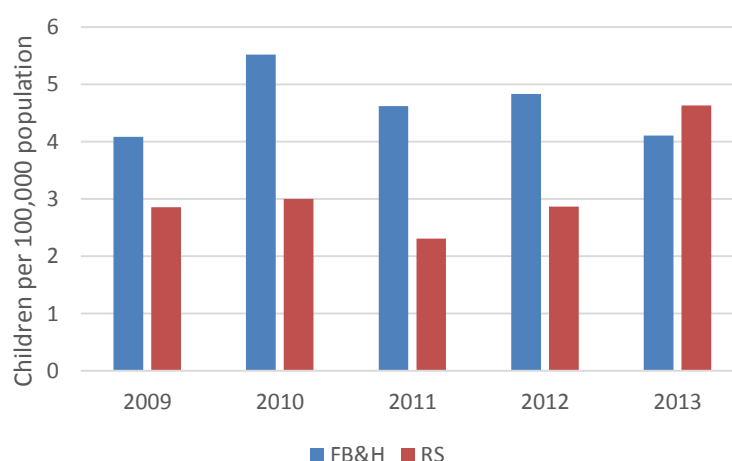
Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Table A4: Five biggest causes of infant deaths in the FB&H and the RS

	2009	2010	2011	2012	2013	Total	Total per 1,000 population
1. Certain conditions originating in the perinatal period (P00-P96)							
FB&H	109	109	82	82	80	462	0.2
RS	34	29	36	30	21	150	0.1
2. Congenital malformations, deformations (Q00-Q99)							
FB&H	30	31	30	25	23	139	0.06
RS	11	8	5	3	4	31	0.02
3. Diseases of the circulatory system (I00-I99)							
FB&H	7	12	8	11	22	60	0.03
RS	0	0	0	0	0	0	0
4. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified(R00-R99)							
FB&H	5	2	2	5	2	16	0.007
RS	4	4	2	4	5	19	0.01
5. Unknown							
FB&H	4	4	5	4	4	21	0.009
RS	0	0	0	0	0	0	0

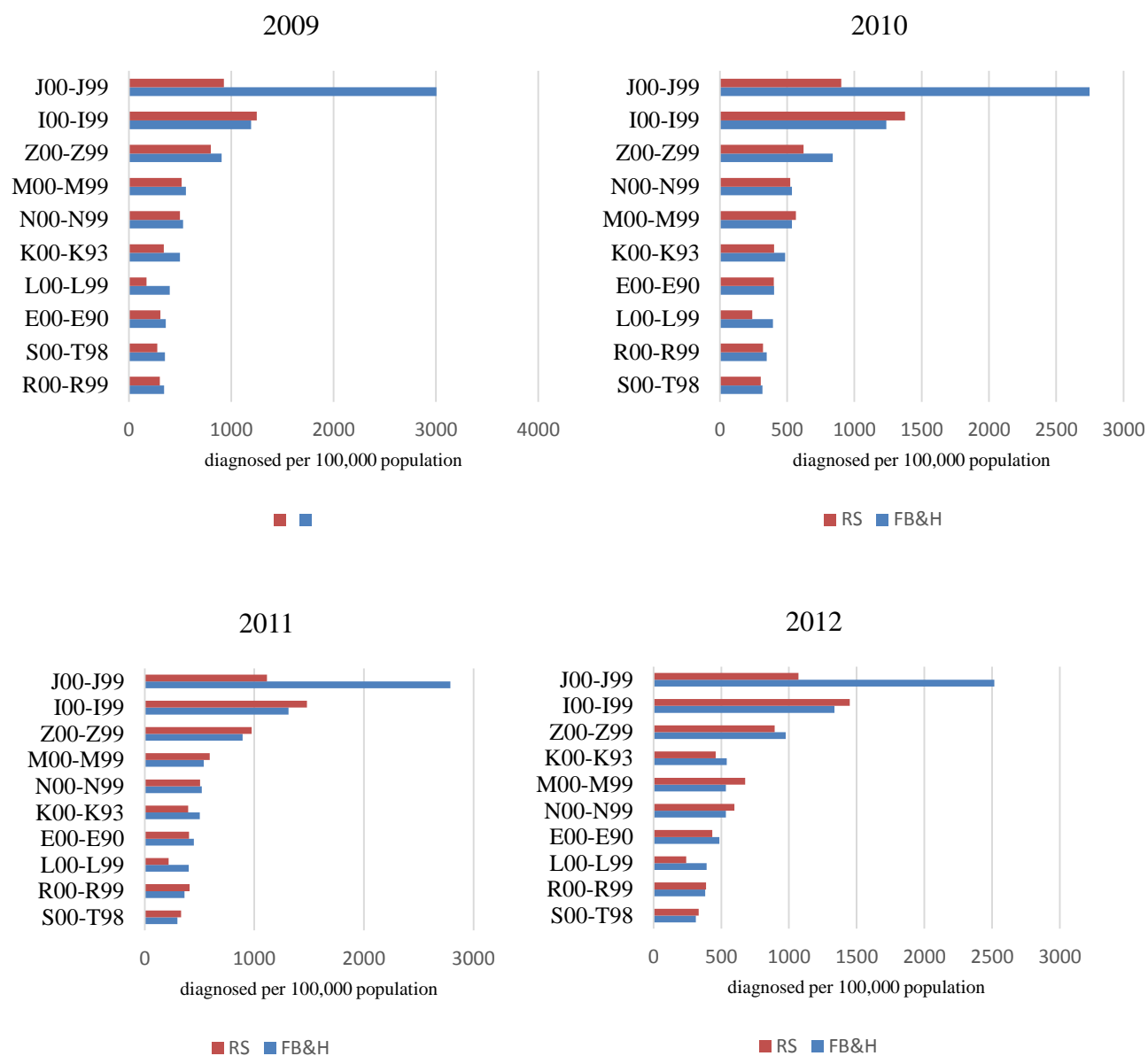
Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Figure A4: Mortality rates for children aged 1-19 in the FB&H and the RS



Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

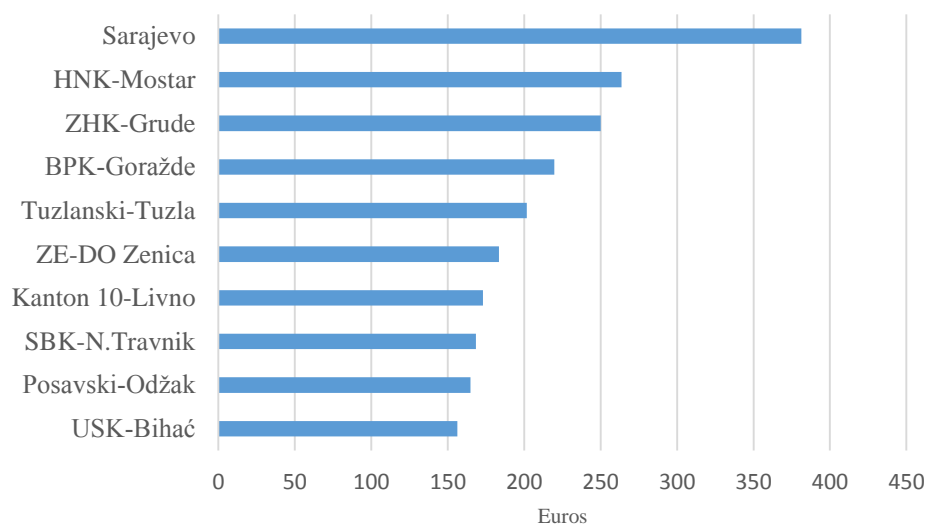
Figure A5: Incidence of diagnosed diseases by type of disease* in the FB&H and the RS



*The classification of the diseases is shown in Appendix, Table A3!

Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014-2010), Institute for Public Health of Republic of Srpska (2014-2010)

Figure A6: Health care expenditures in 10 Cantons in the FB&H, per population, 2013



Source: Data from Health Insurance Fund of Federation of Bosnia and Herzegovina (2013)

Table A5: Number of beds in 10 Cantons in FB&H, per 1,000 population, 2013

Cantons in FB&H		Regions in RS	
Unsko-sanski	1.7	Banja Luka	4.5
Posavski	2.8	Bijeljina	1.8
Tuzlanski	3.2	Doboj	1.6
Zeničko-dobojski	2.9	Istočno Sarajevo	2.4
Bosansko-podrinjski	2.4	Foča	3.5
Srednjobosanski	5.0	Trebinje	5.1
Hercegovačko-neretvanski	4.5	Zvornik	1.4
Zapadno-hercegovački	0.1		
Kanton Sarajevo	5.2		
Kanton 10	2.9		

Source: Data from Institute for Public Health of Federation of Bosnia and Herzegovina (2014), Institute for Public Health of Republic of Srpska (2014)

