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The Feasibility of Conducting Epidemiological Studies in Kosovo

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An Honors Society Project

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Abstract

Environmental pollution remains a salient global problem because of the impacts it has on climate change, economic activity and human health. Increases in the level of pollutants such as PM_{10}, $PM_{2.5}$, CO, NO_2, SO_2 and O_3 have been correlated with increases in the number of people diagnosed with various respiratory, circulatory diseases and cancers as well as death from these diseases. Therefore, for policymakers to be able to address this issue, a plethora of epidemiological studies, using time-series and longitudinal data, have been conducted in different countries to study the linkage between health and environmental pollution. The results from these studies were and can be used as the basis upon which sound public policies are drafted. Kosovo has also experienced a rapid increase in the level of morbidity and mortality from diseases related to environmental pollution. However, there have been no rigorous studies, which illustrate the scope of this problem, i.e., the effect of environmental pollution on morbidity and mortality in Kosovo, due to serious problems with data availability and reliability. Thus, this study provides a comprehensive analysis on the data problems faced by researchers who want to conduct epidemiological studies in Kosovo.

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Abbreviations

WHO – World Health Organization

NCDs – Non-communicable diseases

KSA – Kosovo Statistical Agency

KEPA – Kosovo Environmental Protection Agency

MESP – Ministry of Environment and Spatial Planning

EC – European Commission

ALRI – Acute Lower Respiratory Infections

HAP – Household Air Pollution

COPD – Chronic Obstructive Pulmonary Disease

ARI – Acute Respiratory Infections

AMI – Acute Myocardial Infarction

MI – Myocardial Infarction

SO_2 – Sulfur Dioxide

CO_2 – Carbon Dioxide

NO_2 – Nitrogen Dioxide

CO – Carbon Monoxide

PM_{10} – Particulate Matter with Diameter under 10µm

$PM_{2.5}$ – Particulate Matter with Diameter under 2.5µm

O_3 – Ozone

UCCK – University Clinical Center of Kosovo

NIPHK – National Institute of Public Health of Kosovo

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1.0. Problem Statement

The excessive usage of natural resources has led to rapid economic development of some regions worldwide, but also to a change in the in-situ price of some of these resources and to a myriad of hazardous externalities. These externalities include the high level of air pollution, water pollution, deforestation, environmental degradation followed by increased morbidity and mortality rates (Norman, Carpenter, Scott, Brune, & Sly, 2013). Academic studies have shown that environmental pollution is the reason behind the increasing trend in mortality rates which is specifically caused by the increase in non-communicable diseases (NCDs), such as different types of cancer, circulatory and respiratory diseases. International institutions have been vocal about the causational relationship or rather the vicious cycle of natural resource usage, environmental pollution, and morbidity and mortality rates. The World Health Organization (WHO), for instance, has placed environmental pollutants amongst the top causes of NCDs, thereby emphasizing the salience of exposure to environmental pollution (Budnik, et al., 2018).

Kosovo is the embodiment of this vicious cycle. The country has continuously dealt with severe environmental problems, most notably air pollution, water pollution, and heavy metals contamination. Particularly, the levels of various air pollutants in the country have been shockingly high for the last several years - sometimes the levels being as high as three times the EU allowable standards (KEPA, 2018; World Bank, 2013). However, these issues have become distressing only recently because of the devastating impacts they have shown to have on human health. The number of people diagnosed with NCDs and the number of those dying from such diseases has been increasing rapidly, especially in cities where citizens are exposed to high levels of pollution (KSA, 2015). In 2014 alone more than 70% of deaths in Kosovo were attributed to NCDs (KSA, 2015). Nevertheless, in order to analyze the gravity of such a problem, i.e. the extent to which environmental pollution leads to diseases and mortality from the diseases per se, and to be able to address this problem properly, it is crucial to conduct rigorous epidemiological studies. These studies illustrate the scope of the problem and emphasize which polluters are the most threatening to health and which diseases are the ones mostly causing death; thus, providing the basis upon which specific policies can be drafted. There are no such rigorous, comprehensive, and reliable studies on Kosovo, to the author's knowledge. It is the nature of the

data, the availability of data (or lack thereof), and the unreliability of these data that pose serious challenges to researches who seek to analyze how endemic the problem of health externalities of environmental pollution is in Kosovo.

Against this background, the aim of this study is twofold. In the first part, the study explores the relationship between environmental pollution and morbidity and mortality rates. Specifically, it tries to explain the mortality rate in Kosovo not only by looking at the proximate causes, various types of NCDs, but also by investigating the ultimate causes, exposure to environmental pollution (by using the few data available). The second part of the study illustrates the data problems that researchers face when they want to conduct epidemiological studies of this nature. It specifically analyzes the mortality, health and environmental pollution data from two perspectives; namely, availability and reliability, the two crucial attributes needed to conduct an epidemiological study. To do so, the study first provides a global overview and literature review on the linkage between environmental pollution and human health. Then, it gives information on the environmental status as well as the level of morbidity and mortality rates in Kosovo. The third part of the study provides a detailed analysis of data coverage, availability, lack and discrepancies within the data in causes of death, mortality, health and air pollution reports. Finally, it gives policy recommendations for addressing the issue of data required to conduct such studies.

2.0. Background Information

2.1. Natural Resource Use: A Global Perspective

Economic growth is one of the main goals for countries around the world. Some of these nations, which are aiming towards catch-up growth, have been using their resources in an inefficient and unsustainable manner. The developed countries as well have increased their consumption of world's recourses (SERI, GLOBAL, GWS, 2009). This (over)consumption of natural resources, though, has not always been a pressing issue. But people today use about 50% more of natural resources compared to thirty years ago because, with the increase in world's population, the world's economy has been producing more goods and services (2009). This increase in consumption, within a limited natural base, has been the cause of numerous external costs

whereby the impact of these externalities on human health has made the excessive usage of these resources an important policy issue (Ahmad, El Serafy, & Lutz, 1989). As a result of this (over)consumption, the biophysical and ecological systems, which have significant impact on human health and the "disruption and depletion" of which "makes it more difficult to tackle health inequalities", are affected (McMichae, Frie, Nyong, & Corvalan, 2008). Specifically, intensive extraction of resources leads to air and water pollution, deforestation and forest degradation, destruction of soil quality and fertile land, which push towards increments in morbidity and mortality rates, especially in developing countries (SERI, GLOBAL, GWS, 2009).

2.2. Health Impacts of Environmental Exposure: A Global Perspective

Exposure to environmental pollution has short and long-term effects on health. In the short-run exposure to environmental pollution increases the incidence of different diseases whereas in the long-run human exposure to pollution increases the mortality rate from the diseases per se.

On the mortality side, WHO has reported that in 2012 only, 9 million people have died from air pollution, out of which 2 million were premature deaths and 7 million were adult deaths. From this 7 million, 66% have died from heart diseases, 12% from lung cancer, 23% from COPD, and 74% from strokes (WHO, 2014). In addition, recent data have indicated that around 12.6 million people have died due to risky environmental exposures in 2016 (WHO, 2016). Numbers are expected to increase in the future where by 2040 the number of premature deaths will reach 7.5 million per year due to the increasing trend in environmental pollution (The Lancet, 2016). When it comes to air pollutants, $PM_{2.5}$ alone is responsible for 7.6% of global mortality and it has been ranked as the fifth most risky factor causing mortality (Saud & Paudel, 2018).

On the morbidity side, around 8-9% of the disease burden is attributed to high levels of human exposure to various environmental pollutants. Environmental pollution causes allergies, pushes towards endothelial dysfunction, mental and cardiovascular disorders and so forth (Kelishadi, 2012). Namely, pollution increases morbidity rates because it is the cause of different NCDs, organ disturbances, and various other chronic diseases (2012). Specifically, particular pollutants such as PM have been the cause of low birth weight (LBW), cardiovascular and respiratory diseases (Farmer, Nelin, Falvo, & Wold, 2014). WHO has also reported that the prevalence of

cardiovascular, respiratory diseases and cancer, which fall in the category of NCDs, has been increasing in the recent years and that around 40 million people die every year from these three types of diseases (Budnik, et al., 2018).

3.0. Environmental Pollution and Human Health: A Review of Empirical Evidence

Both developing and developed nations are facing high health costs because of the increase in the number of people diagnosed with different diseases, which are linked to air, water, soil and other forms of environmental pollution and degradation (Saud & Paudel, 2018; Prüss-Ustün, et al., 2017; WHO 2014; Landrigan, et al., 2016; WHO 2016). However, these health effects are more visible and endemic in the developing countries due to problems with sanitation, industrial pollutants, usage of very old power plants, polluted water resources, improper management of waste and so forth (Briggs, 2003; Landrigan, et al., 2016).

Although the cause-effect process between health and environmental pollution is complex, it does happen nonetheless. Existing literature suggests that the relationship between the two is linear because as human exposure to pollution increases so does the probability of developing a disease, the severity of the disease per se or even the probability of death from that disease (Briggs, 2003). Therefore, exposure of humans to pollution increases the chances for these people to develop diseases; especially NCDs such as different types of cancer, circulatory and respiratory diseases (Norman, Carpenter, Scott, Brune, & Sly, 2013). This happens for two reasons: first, people that are exposed to environmental chemicals early in life have a greater probability of developing several chronic diseases later; and second, the long-term exposure to such contaminants "reflects epigenetic effects and gene induction" (2013).

Consequently, many scholars have studied the causational relationship between environmental pollution and NCDs. Various studies have found that there is a linkage between high levels of $PM_{2.5}$, PM_{10}, SO_2, NO_2, O_3 or CO and the prevalence of various cardiovascular, respiratory diseases and cancer as well as deaths from these diseases.

3.1. Respiratory mortality and diseases

A preponderance of empirical evidence shows that there is a link between environmental pollution, respiratory diseases and respiratory mortality. As shown in Table 1, air pollutants such as CO, PM_{10}, $PM_{2.5}$, NO_2, SO_2, and O_3, have been correlated with various respiratory diseases such as bronchiolitis, COPD, ALRI, asthma, rhinitis, cystic fibrosis, and lung infection. These studies have also analyzed the relationship between long vs short-term exposure and indoor vs outdoor air pollution, and the prevalence or probability of incidence of respiratory diseases.

Author	Year	Type of Study	Place of Study	Diseases	Air Pollution	Correlation
Gordon et al.	2014	Systematic Review	Worldwide	Pneunomia, ALRI, respiratory infections, bronchitis, COPD, rhinitis, asthma	HAP, CO, PM2.5, PM10	Pnemonia, ALRI, asmtha, COPD related to HAP; ALRI, repsiratory infections with PM10; COPD, asmtha related to PM2.5; ALRI with CO, PM2.5 and PM10
Badyda et al.	2016	Quantiative Study	Poland	Pneunomia, bronchitis, COPD, asmtha	PM10	Pneunomia, bronchitis, COPD, asmtha with PM10
Liu, Liao, Kuo, and Kuo	2017	Quantiative Study	Taiwan	Respiratory diseases	PM2.5	Respiratory diseases with PM2.5
Chen and Kan	2008	Reivew	Worldwide	Pneunomia, ALRI, respiratory infections, bronchitis, COPD, asthma	CO, NO2, SO2, O3, PM2.5, PM10	Respiratory infections, asthma with PM10; ALRI, pneunomia, bronchitis with PM10, PM.2.5, SO2, NO2, CO; COPD with SO2;asmtha with NO2; Respiratory infections, asthma with O3
Zhang, Qiu, Chung and Huang	2015	Review	China and Taiwan	COPD, rhinitis, asthma	NO2, SO2, O3, PM2.5, PM10	Asmtha, COPD related to O3; asmtha with NO2, PM2.5, PM10; rhinitis with SO2, NO2, PM10
Hwang, Lee, Yi, and Kim	2017	Quantiative Study	South Korea	Respiratory diseases	PM2.5, PM10	Respiratory diseases with PM2.5, PM10
Ferreira et al.	2016	Quantiative Study	Brazil	Respiratory diseases	PM2.5, PM10	Respiratory diseases with PM2.5, PM10
Patella et al.	2018	Systematic Review	Worldwide	COPD, rhinitis, asthma	Air pollution	COPD, rhinitis, asthma with air pollution
Anderson, Thundiyil, and Stolbach	2012	Systematic Review	Worldwide	Pneunomia, respiratory infections, cystic fibrosis, bronchitis, COPD, asthma	PM2.5, PM10	Pneunomia, respiratory infections, cystic fibrosis, bronchitis, COPD, asthma with PM2.5, PM10
Katanoda et al.	2011	Quantiative Study	Japan	Pneunomia, COPD	NO2, SO2, PM2.5, PM10	Pneunomia, COPD with NO2, SO2, PM2.5
D'Amato et al.	2013	Review		ALRI, asmtha	NO2, O3, PM2.5, PM10	Asmtha with NO2, O3, PM2.5, PM10; ALRI with PM2.5, PM10
Agrawal	2012	Quantiative Study	India	Asmtha	Air pollution	Asmtha with air pollution
Ezzati and Kammen	2001	Quantiative Study	Kenya	ALRI	CO, PM10	ALRI with CO, PM10
Li et al.	2018	Systematic Review	China	Asthma, COPD	PM2.5	Asthma, COPD with PM2.5
Zanobetti, Schwartz, and Dockery	2000	Quantiative Study	U.S.	Pneunomia, COPD	PM10	Pneunomia, COPD with PM10

Table 1) Studies relating respiratory diseases with air pollution

Indoor and outdoor air pollution as well as increases in the level of different pollutants have shown to increase the chances of developing mostly asthma, pneumonia and COPD. Specifically, exposure to $PM_{2.5}$ and PM_{10} causes COPD whereas exposure to $PM_{2.5}$, PM_{10} and CO increase the probability of having asthma. For instance, exposure to $PM_{2.5}$, PM_{10} and CO increases the probability of developing asthma by 19.87% for children and 9.53% for adults (Kim, Chen, Zhou, and Huang, 2018). Lie et al., found that a 10μg/m3 increase in PM_{10} has been associated with a 7% increase in the number of people suffering from COPD in Jinan in 2009 whereas Zanobetti, Schwartz, & Dockery found that a 10μg/m3 increase in PM_{10} led to a 1.95% increase in pneumonia in U.S. (2018; 2000). There is also a cause-effect relationship between indoor air pollution and respiratory infections such as laryngo-tracheo-bronchitis and chronic bronchitis. Additionally, air pollution, especially exposure to particulate matter, is associated with increases in ALRI and ARI. Other respiratory diseases caused by air pollution include rhinitis, cystic fibrosis, lung infection, and pulmonary inflammation.

The aforementioned diseases are as a result of both long and short-term exposure to air pollution. Specifically, short-term responses to air pollution are asmtha, pneunomia, cystic fibrosis, and lung infection. Whereas other diseases such as COPD and decreased lung function are effects of long-term exposure to air pollution.

Besides respiratory diesases, both indoor and outdoor air pollution and long-term exposure to various air pollutants causes respiratory death, which has been suggested by numerous scholars, as can be depicted in Table 2.

Author	Year	Type of Study	Place of Study	Air Pollution	Correlation
Nafstad et al.	2004	Quantiative Study	Norway	NO2, SO2	NO2 and SO2 with respiratory death
Anderson, Thundiyil, and Stolbach	2012	Systematic Review	Worldwide	PM10, PM2.5	PM10 and PM2.5 with respiratory death
Katanoda et al.	2011	Quantiative Study	Japan	PM2.5, NO2, SO2	PM2.5, NO2 and SO2 with respiratory death
Prüss-Ustün et al.	2017	Systematic Review	Worldwide	Air pollution	Air pollution to respiratory death
Chen and Goldberg	2009	Review	Worldwide	PMs	Air pollution and PMs to respiratory death
Routledge, Ayres, and Townend	2003	Systematic Review	Worldwide	SO2, NO2, PM10, PM2.5	SO2 and PM10 with respiratory death
Chen and Kan	2008	Systematic Review	Worldwide	PMs, NO2, SO2, O3	PM10, PM2.5, SO2, NO2 with respiratory death
Katsouyanni et al.	1990	Quantiative Study	Greece	SO2, air pollution	Air pollution and SO2 with respiratory death
Hoek et al.	2013	Systematic Review and Meta-analysis	Worldwide	PM2.5, PM10, NO2	PM2.5, PM10, NO2 with respiratory death
Dastoorpoor et al.	2018	Quantiative Study	Iran	O3, PM10, NO2, CO, and SO2	O3, PM10, NO2, CO, and SO2 with respiratory death
Dehghan et al.	2018	Quantiative Study	Iran	PM10, PM2.5, O3, SO2, NO2, CO	PM10, PM2.5, O3, SO2, NO2, CO with respiratory death

Table 2) Studies linking respiratory death with air pollution

Previous literature points out that there is a strong relationship between pollutants such as O_3, SO_2, CO, PM_{10}, $PM_{2.5}$ and NO_2 and respiratory deaths. O_3 shows a statistically significant relationship with respiratory deaths among females, males, people between the ages of 18-60, and people over 60 years old (Dastoorpoor et al., 2018; Dehghan, Khanjani, Bahrampour, Goudarzi, & Yunesian, 2018). Dastoorpoor et al. found that CO is strongly correlated with respiratory deaths amongst males, people older than 60 years and under 18. NO_2, however, is statistically correlated with respiratory deaths of those between 18 to 60 years old, males and females. In addition, both $PM_{2.5}$ and PM_{10} show a strong relation with respiratory deaths (2018; 2018). For instance, a study in US showed that increases in PM_{10} for a short period of time increase respiratory death by 0.87% and on a wider sample by 1.68% (Anderson, Thundiyil, & Stolbach, 2012). As for SO_2, Dastoorpoor et al. found a correlation of this pollutant with respiratory mortality of the total population whereas results from Dehghan, Khanjani, Bahrampour, Goudarzi, & Yunesian show an inverse relationship between these two variables (2018; 2018). In sum, respiratory deaths happen due to the exposure of subjects to high levels of oxidants and pro-oxidants that are part of the aforementioned air pollutants.

3.2. Cardiovascular diseases and mortality

Environmental pollution has been correlated with various cardiovascular diseases as well as death from such diseases. Pollutants such as $PM_{2.5}$, PM_{10}, CO, NO_2 and SO_2 have been the reason behind the increased number of cardiac arrhythmias, AMI, MI, atherosclerosis, heart failure, stroke, cardiac arrest and so forth. Various studies have analyzed the linkage between cardiovascular diseases and mortality, and different pollutants, as well as analyzed the effects of long-term vs short-term exposure to the mentioned pollutants. Some studies that have analyzed the linkage between circulatory diseases and different air pollutants can be observed below in Table 3.

Author	Year	Type of Study	Place of Study	Diseases	Air Pollution	Correlation
Anderson, Thundiyil, and Stolbach	2012	Systematic Review	Worldwide	Atherosclerosis, AMI, congestive heart failure, ischemic heart disease	PM2.5, PM10	Congestive heart failure, ischemic heart disease, atherosclerosis, AMI with PM10, PM2.5
Patella et al.	2018	Systematic Review	Worldwide	Heart failure, MI, arrhythmias, strokes	Air pollution	Heart failure, MI, arrhythmias, strokes with air pollution
Liu, Liao, Kuo, and Kuo	2017	Quantiative Study	Taiwan	Cardiovascular diseases	PM2.5	PM2.5 with cardiovascular diseases
Routledge, Ayres, and Townend	2003	Systematic Review	Worldwide	Ischaemic heart disease, heart failure, arrhythmia, MI, cardiovascular diseases	PM10, CO, O3, SO2, NO2, air pollution	Ischaemic heart disease, heart failure with CO, PM10; arrhythmia with NO2; cardiovascular diseases with SO2, O3; MI with air pollution
Chen and Kan	2008	Systematic Review	Worldwide	Cardiovascular diseases, strokes,	SO2, O3, PM2.5	Cardiovascular diseases with SO2, PM2.5; strokes with O3
Ferreira et al.	2016	Quantiative Study	Brazil	Cardiovascular diseases	PM2.5	Cardiovascular diseases with PM2.5
Buadong, Jinsart, Funatagawa, Karita and Yano	2009	Quantiative Study	Thailand	MI, arrhythmias	PM10, O3	MI, arrhythmias with O3 and PM10 to some extent
Hwang, Lee, Yi, and Kim	2017	Quantiative Study	South Korea	Cardiovascular diseases	PM2.5, PM10	Cardiovascular diseases with PM2.5, PM10
Mishra	2017	Systematic Review	Worldwide	AMI, heart failure, arrhythmias, cardiac arrest, congential heart disease	PM10, PM2.5, SO2, NO2, CO	PM10, PM2.5, SO2, NO2, CO with AMI, arrhythmias; CO, SO2, NO2 with heart failure; PM2.5, PM10, CO wirh cardiac arrest; CO, O3 with congential heart disease
Kim et al.	2017	Quantiative Study	South Korea	AMI, strokes, congestive heart failure	PM10, PM2.5, SO2, NO2, CO, O3	AMI, strokes, congestive heart failure with PM10, PM2.5, SO2, NO2, CO, O3
Peña and Rollins	2017	Systematic Review	Worldwide	Atherosclerosis, stroke, AMI, heart failure, cardiac arrest	Air pollution	Atherosclerosis, stroke, AMI, heart failure, cardiac arrest with air pollution
Rabiei et al.	2017	Quantiative Study	Iran	Cardiovascular diseases	PM10, PM2.5, SO2, NO2, CO, O3	Cardiovascular diseases with PM10, PM2.5, SO2, NO2, CO, O3
Bourdrel, Bind, Béjot, Morel, and Argacha	2017	Systematic Review	Worldwide	Arrhythmia, strokes, heart failure, cardiac arrest	NO2, PM2.5, SO2, CO, O3	Arrhythmia with PM2.5 and NO2; cardiac arrest with PM2.5 and O3; heart failure, strokes with PM2.5, NO2, CO, SO2

Table 3) Studies linking cardiovascular diseases with air pollution

Scholars have found that the incidence of AMI and MI, and the risk of developing such diseases increases with an increase in the level of $PM_{2.5}$ and PM_{10}, and to a lower degree other air pollutants. For instance, in London 1 in 50 MIs are caused by outdoor air pollution (Routledge, Ayres, & Townend, 2003). In Europe "annual increases of 10μg/m3 in PM_{10} and 5μg/m3 in $PM_{2.5}$ were associated with increased risks of myocardial infarction of 12% and 13%, respectively" (Bourdrel, Bind, Béjot, Morel, & Argacha, 2017). Moreover, increases in the level of various pollutants has also been correlated with prevalence of heart failure, atherosclerosis and different types of arrhythmias. For example, evidence has been found to correlate carotid intima medial thickness, cause of atherosclerosis, with $PM_{2.5}$ and other contaminants (Mishra, 2017). Finally, ischemic heart disease, congenital heart disease and cardiac arrest have been linked to $PM_{2.5}$, PM_{10}, NO_2, CO, O_3 and SO_2. For instance, a 10μg/m3 increase in PM_{10} has been correlated with a 0.8% increase in hospital admissions for congestive heart failure and 0.7% for ischemic heart disease (Anderson, Thundiyil, & Stolbach, 2012). Specifically, ventricular septal defects have been linked with CO; alvular, aortic, and truncal defects related with O_3; and hypertension and stroke with similar pollutants (2012).

Long-term exposure to environmental contaminants has been correlated with an overall increase in cardiovascular morbidity, especially chronic circulatory diseases, and mortality. Short-term exposure, especially to PM, on the other hand, has usually been associated with circulatory diseases such as heart failure, ischemic heart disease, MI, arrhythmia, or other heart diseases.

Lastly, expoure to envrionmental pollution has been associated with cardiovascular death. Some of the studies linking air pollution to cardiovascular mortality can be seen in Table 4.

Author	Year	Type of Study	Place of Study	Air Pollution	Correlation
Prüss-Ustün et al.	2017	Systematic Review	Worldwide	Air pollution	Cardiovascular mortality with air pollution
Chen and Goldberg	2009	Review	Worldwide	PMs	Cardiovascular mortality with PM10, PM2.5
Anderson, Thundiyil, and Stolbach	2012	Systematic Review	Worldwide	PM2.5, PM10	Cardiovascular mortality with PM2.5, PM10
Katsouyanni et al.	1990	Quantiative Study	Greece	SO2, air pollution	Cardiovscular mortality with SO2, air pollution
Hoek et al.	2013	Systematic Review and Meta-analysis	Worldwide	PM2.5, PM10, NO2	Cardiovascular mortality with PM2.5, PM10
Chen and Kan	2008	Systematic Review	Worldwide	SO2, O3, PM2.5, PM10	Cardiovascular mortality with SO2, O3, PM2.5, PM10
Mishra	2017	Systematic Review	Worldwide	PM10, PM2.5, SO2, NO2, CO	Heart failure mortality with CO, SO2, NO2; cardiovascular mortality with PM2.5, PM10
Kim et al.	2017	Quantiative Study	South Korea	PM10, PM2.5, SO2, NO2, CO, O3	Cardiovascular mortality with PM2.5, PM10, SO2, NO2, CO, O3
Peña and Rollins	2017	Systematic Review	Worldwide	Air pollution	Cardiovascular mortality with air pollution
Patella et al.	2018	Systematic Review	Worldwide	PMs	Cardiovascular mortality PM10, PM2.5
Zhang et al.	2011	Quantiative Study	China	PM10, SO2, NO2	Cardiovascular mortaity with PM10, SO2
Sadeghi, Ahmadi, Baradaran,Masoudipoor, and Frouzandeh	2015	Quantiative Study	Iran	PM10, NO2, CO, SO2, O3	MI mortality with SO2, CO, O3
Zhao, Liang, Chen, Chen, Guan, and Li	2017	Systematic Review and Meta-analysis	Worldwide	PM10, PM2.5, O3, SO2, NO2	Cardiovascular mortality PM10, PM2.5, O3, SO2, NO2
Bourdrel, Bind, Béjot, Morel, and Argacha	2017	Systematic Review	Worldwide	PM10, SO2, NO2, PM2.5	Cardiovascular mortality with PM10, PM2.5, NO2
Routledge, Ayres, and Townend	2003	Systematic Review	Worldwide	PM10, CO, O3, SO2, NO2, air pollution	Cardiovascular mortality with PM10, CO, O3, SO2, NO2

Table 4) Studies linking cardiovascular mortality with air pollution

For example, Routledge, Ayres, & Townend, showed that a 50% decrease in SO_2 has been associated with a 2.4% reduction in circulatory mortality in Hong Kong (2003). Particularly, there has been a strong relationship established between the level of concentration of PM_{10}, $PM_{2.5}$ and NO_2, and cardiovascular death (Zhao, et al., 2017; Kim, et al., 2017; Patella, et al., 2018; Zhang, et al., 2011). An increase of 10µg/m3 and long-term exposure to $PM_{2.5}$ increases the risk of cardiovascular mortality by 36%; however, exposure to PM_{10}, CO, SO_2, and NO_2 also increases the probability of circulatory death but not as much as $PM_{2.5}$ does (Zhao, et al., 2017; Kim, et al., 2017). In China, an increase of 10µg/m3 in PM_{10} was linked with a 55% increase in the probability of cardiovascular death (Zhang, et al., 2011). Moreover, evidence from a study conducted by Bourdrel, Bind, Béjot, Morel, & Argacha shows that 10µg/m3 increase and long-term exposure to $PM_{2.5}$ and NO_2 increases cardiovascular death by 11% and 13% respectively (2017).

3.3. Cancer Incidence and Mortality

Exposure to different environmental pollutants causes different types of cancer. Different epidemiological studies have analyzed the possible linkage between the onset and probability of developing lung cancer and different environmental pollutants, explanations of which are further discussed below.

There is evidence that correlates the increase in air pollution and the incidence of lung cancer as can be seen in Table 5.

Author	Year	Type of Study	Place of Study	Diseases	Air pollution	Correlation
Patella et al.	2018	Systematic Review	Worldwide	Lung cancer	PMs	Lung cancer with PM2.5
Gordon et al.	2014	Systematic Review	Worldwide	Lung cancer, upper airway cancers	HAP, CO, PM2.5, PM10	Lung cancer, upper airway cancers with HAP
Stabile et al.	2019	Quantiative Study	Italy	Lung cancer	PM10, SO2, CO2	Lung cancer with PM10
Kulhánová et al.	2018	Quantiative Study	France	Lung cancer	PM2.5	Lung cancer with PM2.5
Li et al.	2018	Systematic Review	China	Lung cancer	PM2.5	Lung cancer with PM2.5
Burnett et al.	2018	Systematic Review	Worldwide	Lung cancer	PM2.5	Lung cancer with PM2.5

Table 5) Studies linking lung cancer with air pollution

Evidence on the causational relationship between pollution and other types of cancer such as upper airway cancers is inconclusive whereas there has been evidence linking environmental pollution and especially HAP with respiratory tract cancer (Gordon, et al., 2014). For instance, in China a decrease in exposure to $PM_{2.5}$ has proven to be related with a decrease in malign and non-malign tumors (Kulhánová, et al., 2018). Li et al., also found that $PM_{2.5}$ has been linked to about 800,000 cases of cancer in 2004 and to over 1.2 million cases in 2012 in China (2018).

Long-term expsoure to PM_{10} and $PM_{2.5}$ but also other pollutants, increases lung cancer mortality as well as the number of those diagnosed with lung cancer. On the other hand, short-term exposure to different pollutatnts increases the risk or the probability of developing different types of cancer but evidence for short-term exposure is less strong than that for long-term exposure.

From Table 6, it can be seen that cancer mortality has also been associated with increases in the level of different pollutants.

Author	Year	Type of Study	Place of Study	Air Pollution	Correlation
Prüss-Ustün et al.	2017	Systematic Review	Worldwide	Air pollution	Lung cancer mortality with air pollution
Chen and Goldberg	2009	Review	Worldwide	PMs	Lung cancer mortality with PM10, PM2.5
Chen and Kan	2008	Systematic Review	Worldwide	SO2, O3, PM2.5, PM10	Lung cancer mortality with SO2, PM2.5
Li et al.	2018	Systematic Review	China	PM2.5	Lung cancer mortality with PM2.5
Katanoda et al.	2011	Quantiative Study	Japan	PM2.5, NO2, SO2	Lung cancer mortalitywith PM2.5, NO2, SO2
Nafstad et al.	2004	Quantiative Study	Norway	NO2, SO2	Lung cancer mortality with NO2
Ni, Xiao, Zhong, and Feng	2018	Quantiative Study	Worldwide	Air pollution	Lung cancer mortality with air pollution

Table 6) Studies linking lung cancer mortality with air pollution

For instance, Katanoda et al., found that both men and women living in an area where they would be more exposed to air pollutants such as $PM_{2.5}$ and NO_2, faced higher probability of developing lung cancer and higher probability of dying from this disease (2011). Also, a

10μg/m3 increase in the concentration level of $PM_{2.5}$, SO_2 and NO_2 was found to increase lung cancer mortality (Burnett, et al., 2018; Nafstad, et al., 2004; Katanoda, et al., 2011). Specifically, an increase of 10μg/m3 in PM_{10} and $PM_{2.5}$ leads to 15-27% probability of lung cancer mortality (Li, et al., 2018, Chen & Goldberg, 2009). In addition, Chen and Kan also found that a 10μg/m3 increase in $PM_{2.5}$ is linked with 8% of lung cancer deaths (2008).

4.0. Data Required for Epidemiological Studies

For policymakers to be able to draft policies related to high morbidity and mortality rates in a country, they need clear and reliable information coming from epidemiological studies. However, for such studies to be conducted a researcher needs to have specific types of data available to illustrate if and how much does environmental pollution lead to the prevalence of NCDs and mortality from such diseases. Specifically, for these epidemiological studies, it is necessary that high-quality and uninterrupted data are available; i.e., there must be no gaps within time-series or longitudinal data nor biases during the data gathering process.

Two sets of data are crucial for conducting an epidemiological study. The first set of data is related to environmental pollution whereas the second set must contain health and mortality data. The former set of data needs to contain time-series data regarding the level of air pollution, specifically the level of CO, O_3, NO_2, SO_2, $PM_{2.5}$, and PM_{10} (annual or daily average concentrations). The latter set of data needs to include very detailed and disaggregated data for respiratory, cardiovascular diseases and cancer as well as mortality data from the diseases per se.

If the study design of the research follows a path of statistical analyses that are done using longitudinal data, then the data for morbidity and mortality need to be divided in subgroups and contain information on variables such as patient's age, gender, socio-economic status and area of living, including other dummy variables for example, whether the patient smokes or not (Zeger, Dominici, McDermott, & Samet, 2008; Nakhlé, et al., 2015; Berglind, et al., 2010; Dastoorpoor, et al., 2018; Dehghan, Khanjani, Bahrampour, Goudarzi, & Yunesian, 2018; Hu, Liebens, & Rao, 2008; Rabiei, et al., 2017; Burnett, et al., 2018; Katanoda, et al., 2011; Badyda, Gayer, Czechowski, Majewski, & Dąbrowiecki, 2016; Hwang, Lee, Yi, & Kim, 2017; Liu, Liao, Kuo, & Kuo, 2017; Ferreira, et al., 2016; Kim, et al., 2017; Zhang, et al., 2011; Buadong, Jinsart,

Funatagawa, Karita, & Yano, 2009; Sadeghi, Ahmadi, Baradaran, Masoudipoor, & Frouzandeh, 2015; Agrawal, 2017; Ezzati & Kammen, 2001). Such datasets can be constructed using patient case data over the years. For instance, data for respiratory diseases should be divided into data for specific respiratory diseases then these data should be divided by municipality, gender, age, and socio-economic status of the patient. Namely, a female patient number x who falls between the ages of 30-40, lives in Prishtina, is employed, was admitted in a hospital in 2017 and has had asthma attacks would be the first observation – so the first observation is female, 30-40, Prishtina, employed, asthma attacks. On the other hand, if the study design of the research follows a path of statistical analyses that are done using time-series data then the data for morbidity and mortality can be aggregate for respiratory, cardiovascular diseases or cancer in general or divided by type of disease such as ischemic heart diseases, asthma, lung cancer and the like.

Consequently, as shown in Figure 1, to conduct an epidemiological study and run a regression analysis, the researcher needs to construct a database which is comprised of the following variables:

- specific diseases within the three major groups of cardiovascular, respiratory diseases and cancer;
- level of SO_2, NO_2, O_3, PM_{10}, $PM_{2.5}$, and CO;
- demographics such as age, gender, area of living, socio-economic status;
- causes of death divided according to the disease that caused the death;

Furthermore, disaggregated data, and as such studies using longitudinal data, are better in explaining the link between increased level of environmental pollution and morbidity and mortality rates because they show the magnitude of this causal link while holding the effect of other variables constant. Aggregate data, on the contrary, and thereby studies conducted using time-series data are important as well, but only to some extent because they merely show the potential correlation between environmental pollution and morbidity and mortality rates, which means they are more vulnerable to criticisms (ibid). Therefore, to illustrate this causational

relationship it is necessary for the researcher to possess longitudinal data or to construct such databases using patient case data.

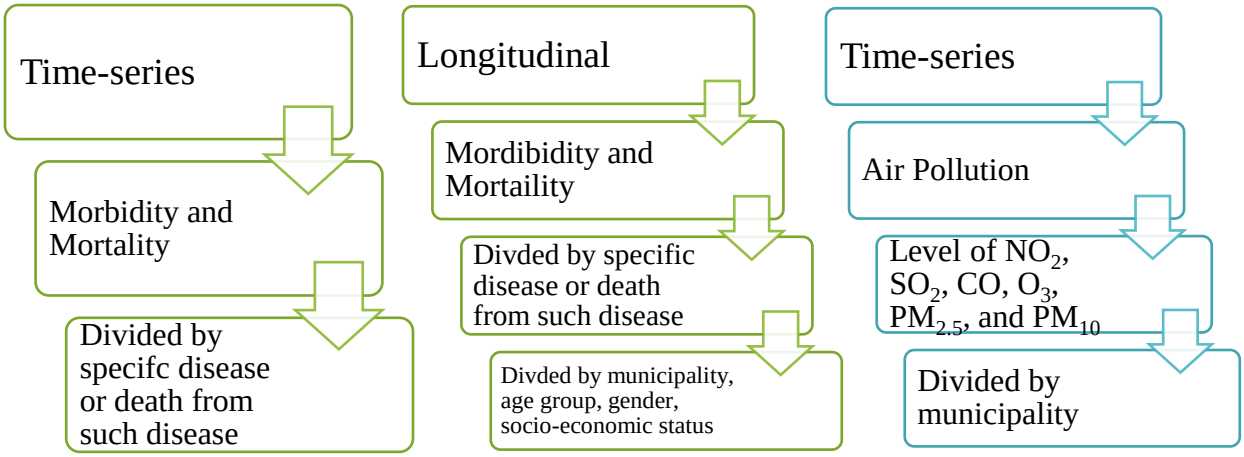


Fig 1) The data necessary for conducting epidemiological studies

The annual or daily average level of pollutants is needed to see if and how the number of people suffering from specific diseases changes when there is a change in the level of one of the pollutants. Demographics are crucial because environmental exposure does not impact all the age groups or genders, nor people coming from different socio-economic backgrounds or different cities in the same way (ibid). In general, the part of the population most vulnerable to environmental pollution are the elderly and children whereas genders are affected somewhat the same with males showing higher morbidity or mortality rates when exposed to outdoor air pollution. Likewise, the socio-economic variable is important because people that mostly suffer from exposure to environmental pollution are the ones in poverty; usually the level of income or the employment status are taken as proxies for this variable. The area of living is the most important variable because if a country or a city is shown to be more polluted than the others then morbidity and mortality rates in that country/city will be higher. In some studies, smoking is taken as a variable as well, especially when analyzing the relation between environmental pollution and lung cancer incidence and mortality, in order to control for the effect of smoking since smoking has proven to be related to lung cancer. In addition to these data, some of these epidemiological studies include time-lagged variables because an increase in the level of a pollutant today will show its true impact in health later (ibid).

Finally, some of the estimation models used in these studies are those used to calculate hazard ratios or rate ratios. Models for both studies, with time-series or longitudinal datasets, include cox regression models, generalized additive models, distributed lag models, and so forth (ibid).

5.0. Methodology

In order to analyze the two research questions, one, whether morbidity and mortality rates are related to environmental exposure in Kosovo, and two, whether there are good quality data for conducting epidemiological studies in the country, this study used both primary and secondary data.

Secondary data were gathered from published sources, local and international. Information regarding mortality from respiratory, cardiovascular diseases and cancer in Kosovo were extracted from Kosovo Statistical Agency (KSA) whereas data regarding the level of pollutants such as PM_{10}, $PM_{2.5}$, O_3, NO_2, SO_2 and CO were extracted from Kosovo Environmental Protection Agency (KEPA). Other information regarding mortality from NCDs, at a global level, were gathered from international organizations' reports such as World Bank or WHO. Finally, a thorough literature review was conducted by analyzing academic studies that have investigated the effect of environmental pollution on morbidity and mortality rates. These studies varied from systematic reviews and meta-analyses to quantitative analyses on developed as well as developing countries.

Primary data, on the other hand, are qualitative in nature and were collected through interviews with the representatives of University Clinical Center of Kosovo (UCCK), non-governmental organizations and local institutions. Firstly, interviews with doctors in the clinics of cardiology, pulmonology and oncology in UCCK were conducted. The physicians from these three fields were selected because of their expertise regarding cardiovascular, respiratory diseases and cancer respectively, and because they are the ones that mostly deal with paperwork and data gathering. Moreover, these physicians from the hospital in Prishtina were selected because of the environmental status of the city, and because the city has the lowest average age of death and highest mortality rates in the country. Secondly, interviews were conducted with NGOs, which are working in the field of sustainable development and environmental issues, to illustrate the

problems that these organizations face due to the lack of data and epidemiological studies in the country. Finally, interviews with local institutions involved in data collecting were conducted in order to better understand the process of data gathering, gaps in data, and institutional cooperation in the field of public transparency.

Interviews for all parties were semi-structured and contained 6-8 questions. The interviews were 30 to 40 minutes long. Each of the interviewees was given a consent letter to sign which explained what the study is about, that the information from the interview is confidential and will be used only for academic purposes (see appendices 9 & 10).

The whole study followed a method of compare and contrast. The statistics from international organizations and different studies were used to illustrate the problem of health effects of environmental pollution globally, and served at the same time as a basis for emphasizing the salience of having such epidemiological studies in a country such as Kosovo, due to its environmental status. Then statistics from KEPA and KSA were used to illustrate that Kosovo is also suffering from high levels of air pollution, morbidity and mortality rates. Namely, for answering the first research question global data were compared with local data. Study designs and data types from various academic papers were analyzed to show the data needed for conducting proper epidemiological studies. Then an in-depth analysis of data available in Kosovo as well as information from different interviews were used to expose the problems with data in the country, i.e. showing if and why it is problematic to conduct epidemiological studies in Kosovo. In other words, for answering the second research question, information from reports published by local institutions were compared with information used by academic studies conducted worldwide. Moreover, the same method of compare and contrast was used when analyzing local reports to discover the data issues, which were merely emphasized by the interviewees later on, form which contributed to answer the second research question more holistically.

6.0. Analysis of Results

6.1. Environmental Issues in Kosovo

The increase in the consumption of natural resources, and the externalities such consumption has, is an alarming issue in Kosovo. Three salient and interrelated environmental issues in the country when it comes to externalities but also specifically with regards to health are: air and water pollution, and heavy metals contamination.

6.1.1 Air Pollution in Kosovo

Air pollution continues to be the most alarming environmental problem in Kosovo, especially for the areas of Prishtina, Obiliq, Drenas, and Mitrovica. The most prominent pollutants are particulate matter, sulfur dioxide, nitrous oxides, lead, and carbon oxides (KEPA, 2018); however, the main sources of air pollution are coal fired power plants (Kosovo A and B); followed by road, rail and air transport; industrial complexes (Ferronikel, Sharrcem); public district heating companies (in Prishtina, Gjakova, and Mitrovica); and household heating (2018). The emission levels released by the mentioned sources, especially by power plants, are above what the EU European Commission (EC) Directive for Large Combustion Plants considers as allowable; however, the level of some pollutants has not been above such levels (see appendix 1) (World Bank, 2013).

According to KEPA the level of SO_2 in Kosovo has significantly increased from 2015 to 2018 (KEPA, 2018). The latest data for 2018 show that the level of SO_2 in Obiliq was 63.82µg/m3 whereas in Prishtina it was 20.98µg/m3 in IHMK monotoring station and 35.10µg/m3 in Rilindja station (KEPA, 2019). The alarming difference in the level of SO_2 across the years shows that the level of this pollutant in the air has been increasing sharply (see appendix 2). Nevertheless, the level of SO_2 continues to be within the limits of EU allowable standards. The level of NO_2 in the country has increased over the last years but it has been particularly high in 2015, 2016, and 2017 (KEPA, 2018). Data for 2018 show that the level of NO_2 in Obiliq was 17.9µg/m3 whereas in Prishtina it was 36.11µg/m3 and 41.46µg/m3 in IHMK and Rilindja monitoring stations respectively. The level of NO_2 over the years has not exceeded the allowable level set by EU, though, in the last two years the level of this pollutant has increased drastically, approaching

rather fast the allowable standard (see appendix 3). The share of O_3 in the air has been increasing as well in Kosovo and it has achieved its peak levels during 2013, 2015 and 2016 (KEPA, 2018). In 2018, the level of O_3 in Obiliq was 61.40µg/m3 whereas in Prishtina it was 36.32µg/m3 in IHMK and 35.15µg/m3 in Rilindja stations. The level of O_3, however, has historically been under the EU allowable standard (see appendix 4) (2018). As with other pollutants in Kosovo, the level of CO in the air has been increasing, where the highest levels have been reached during 2015 and 2016 (KEPA, 2018). Latest data for 2018 show that the level of CO in Obiliq has been 0.97µg/m3, and in Prishtina it has been 2.65µg/m3 in Rilindja and 2.45µg/m3 in IHMK stations. Although an increasing trend in the level of this pollutant is visible (see appendix 5), the level of CO has continuously remained below the standard put forth by EU. Finally and most importantly, there has been an astonishingly increasing trend on the level of PMs in the last years in the country. Latest data point out that the level of PM_{10} in 2018 in Obiliq was 43.17µg/m3 whereas in Prishtina it was 40.36µg/m3 and 37.01µg/m3, based on the data from IHMK and Rilindja, whereas the level of $PM_{2.5}$ was 32.01µg/m3, 29.30µg/m3 and 25.80µg/m3 respectively. Additionally, PM_{10} has been higher than the acceptable level, 40µg/m3, from 2013 to 2018 (see appendix 6). The same has been true for $PM_{2.5}$ from 2013 to 2018 where the level of this pollutant has been much higher than the threshold of 25µg/m3 (see appendix 7) (2018). Sometimes the level of $PM_{2.5}$ was extremely high, such was the case in 2015 with almost all regions in the country where the level of $PM_{2.5}$ was three to almost four times higher than the allowable standard.

In sum, the excess in PM_{10}, $PM_{2.5}$, and NO_2 to some extent, has been the cause of the continuous increase in the level of air pollution in Kosovo whereas both Kosovo A and B have been the main sources of these pollution (KEPA, 2018).

6.1.2. Water Pollution in Kosovo

Kosovo has limited water resources and the main sources it has are rivers, underground water and lakes (MESP, 2010). The four main rivers are Drini i Bardhë, Ibri, Lepeneci, and Morava e Binçës, which are unequally distributed across the country. The underground water is mostly found in Western Kosovo. The surface water, artificial lakes, is represented by Gazivoda, Batllava, Badovc, Radoniqi, and Perlepnica reservoirs which are limited as well (KEPA, 2018).

Therefore, when it comes to water resources, Kosovo faces two problems: water scarcity and water pollution. The former occurs as a result of an increase in the demand for water due to the increase in population, which puts pressure in the limited water resources; whereas the latter occurs as a result of the discharge of solid waste, industrial and agricultural waste, and sewage in the water (World Bank, 2013). For the purposes of this study, the focus will be on water pollution.

The water resources of the country are contaminated by different chemicals, waste and bacteria released into the water. The drinking water is mostly polluted by bacteria. Such bacteria are found in the water supply systems of urban and rural areas and those bacteria usually come from wastewater and fecal discharge (World Bank, 2013). The other sources of pollution, chemicals and industrial waste, come from Kosovo Energy Corporation, Ferronikeli, Sharrcem, Trepca, Kishnica, Artana, and other mines. Water is contaminated by air pollutants as well, because such pollutants can cause acid rain which then directly impacts the quality of water (KEPA, 2018). However, the level of such contaminants in the water has not exceeded the allowable amount put forth by EU in contrast to chemicals such as cadmium, lead and nickel, which are above the allowable amount and which have great health implications (see appendix 8) (MESP, 2010).

6.1.3. Lead and other Heavy Metals Contamination

One other major environmental issue in Kosovo, which is related to air and water pollution, and soil degradation as well, is lead and other heavy metals contamination. Lead contamination was an alarming environmental issue after the end of the war in 1999 in the region of Mitrovica. High levels of lead contamination in the past were as a result of Zvecan smelter which was operational until 2000 (World Bank, 2013). In 2004, WHO reported that the blood samples of children under 4 in Mitrovica, Prishtina, Zubin Potok and Zvecan, showed high levels of lead. 95% of children in Kosovo had a BLL of 2–5µg/dL whereas those living in Mitrovica region had a much higher BLL since they were more exposed to lead (World Bank, 2013). Hence, due to the high levels of lead that were found in the blood of many residents, Zvecan smelter was shut down, which in turn decreased dramatically the level of lead contamination. However, because lead mines are still operational in the area, different chemicals, one of which is lead, continue to pollute the air, water and degrade the soil (2013).

Latest evidence emphasize that the overall concentration of lead in soil in Mitrovica region has shown to be quite high, between 100 and 300 mg/k. Whereas 10% of these soil samples showed very high levels of lead, above 2000 mg/kg (Borgna, et al., 2009). Other heavy metals such as cadmium, zinc, copper, arsenic were also found in the soil, which are damaging its quality, but not at such high levels as lead (2009; Ferati, Kerolli-Mustafa, & Kraja-Ylii, 2015). With regards to the air being contaminated by such heavy metals, there is evidence that suggests that there is high concentration of lead, cadmium and zinc in the air; and that the main sources of such heavy metal contamination of the air have been industrial complexes and transportation (Maxhuni, Lazo, Kane, Qarri, & Marku, 2016). Thus, heavy metals' contamination remains a major problem for Kosovo because it contributes to increasing the level of air, water and soil pollution.

6.2. Overview of Morbidity and Mortality in Kosovo

Long-term and short-term exposure to environmental pollution has devastating implications for human health. This is especially the case in Kosovo where morbidity and mortality rates have increased rapidly in the recent years and so too has environmental pollution.

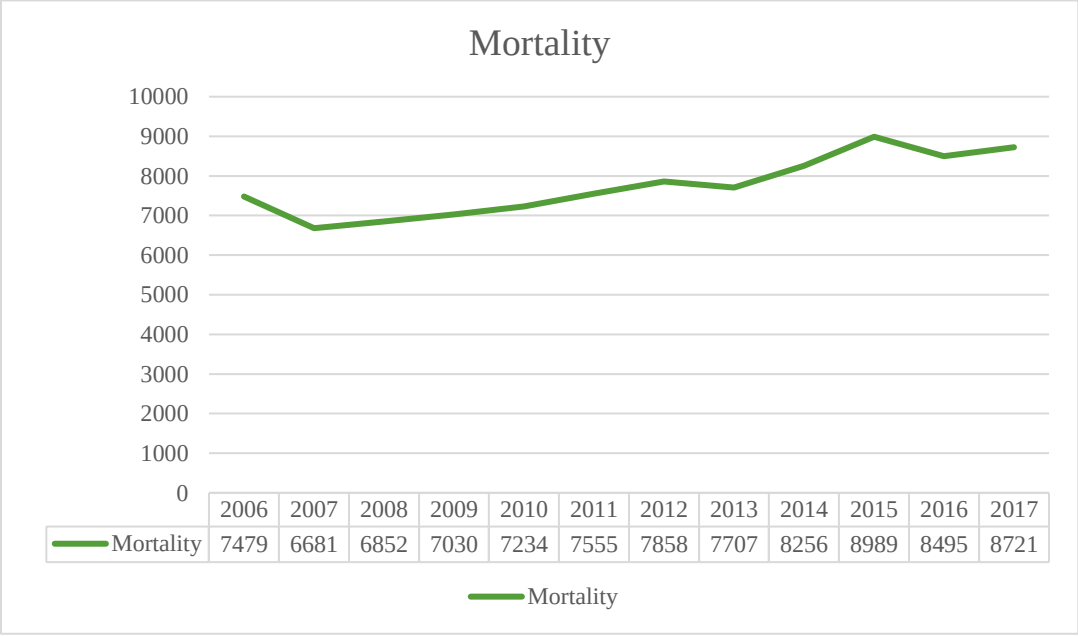
According to the KSA, the total number of deaths in 2017 was 8721 compared with 2015 and 2013 in which the number of deaths was 8202 and 7234 respectively (KSA, 2018). The percentage of those that have died from NDCs such as tumors, respiratory and cardiovascular diseases in 2014 alone has been 76.7% (KSA, 2015). At the same time, the number of people diagnosed with malign and benign tumors and respiratory and circulatory diseases has also been increasing over the years. For instance, in 2012 the number of people treated from malign and benign tumors has been 1588 compared to 2016 when this number increased by more than one thousand (KSA, 2017). In addition, Kosovo faces great discrepancies in the average age of death between cities. Although the average age of death has increased through the years, it remains lower than that of most European countries and it is especially low for cities that are exposed to different environmental pollutants. For instance, in 2014, the average age of death in Peja (a less polluted city) was 68.4 whereas in Prishtina (the most polluted city) the average was 65.3 (KSA, 2018). This gap gets even bigger over the years: in 2016 the average age of death in Peja was 71.0 compared to Prishtina where it was 66.2 (2018). There are also differences in morbidity numbers between the two regions. Recent data show that in 2017 the difference in the number of

people diagnosed with malign tumors is huge between Prishtina and Peja with 459 and 187 cases respectively (KSA, 2018). However, these numbers should be taken cautiously as people from Peja region might go to Prishtina and hence register there.

Consequently, the high levels of morbidity and mortality rates and increased level of environmental pollution in Kosovo need to be analyzed thoroughly in order to explore potential linkages between the two. The great differences in mortality and morbidity rates as well as average age of death and environmental pollution in different cites emphasize the possibility of a causational relationship between the increased number of NCDs and mortality from these diseases in different cities and the country as a whole, and environmental pollution.

6.2.1. Mortality in Kosovo

Morality rate in Kosovo has been increasing in the recent years. 7234 cases of deaths were reported in 2010 compared to 7707 that have occurred in 2013 to 8721 in 2017 (KSA, 2018). Such increases in the number of deaths across years in the country can be seen in Graph 1.

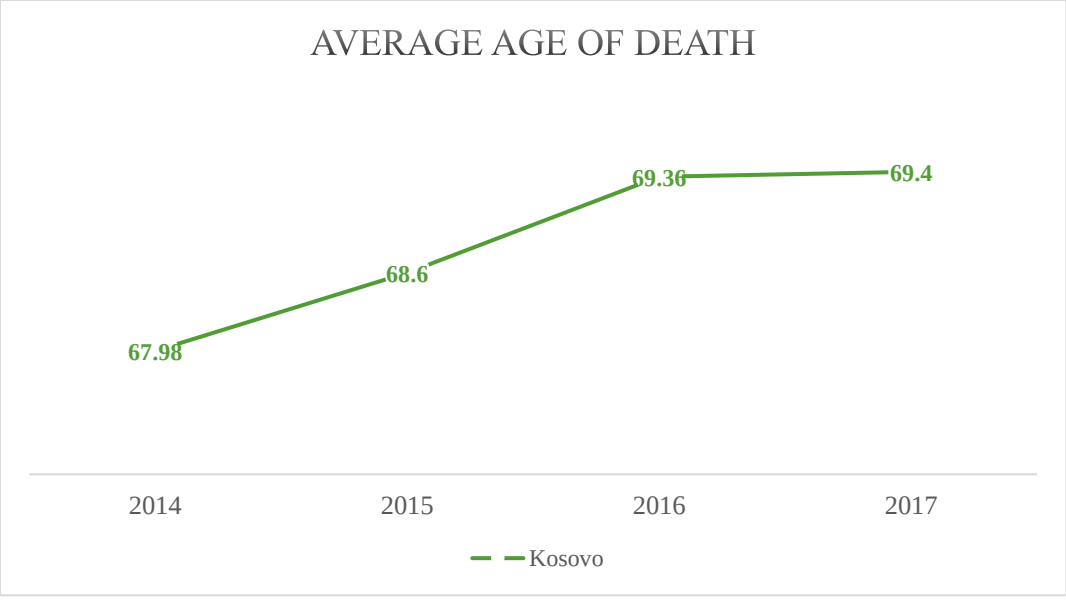


Graph 1) The number of deaths for the period 2006-2017 in Kosovo

Also, morality has varied over time across different municipalities. For example, in 2010 the number of deaths in Peja was 381 and in Prishtina it was 727, whereas in 2014 the number of

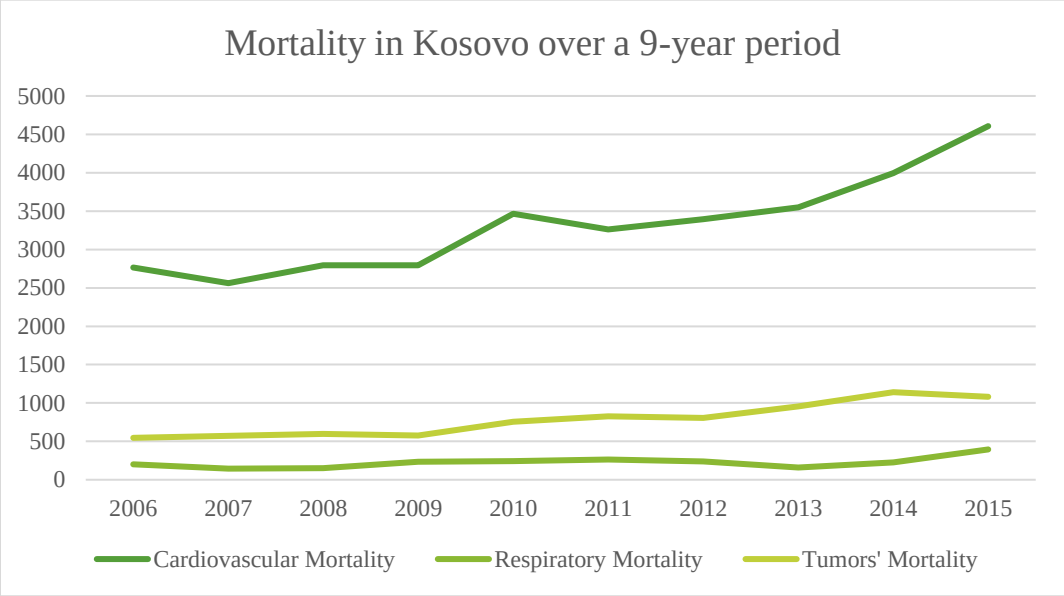
death was 430 and 773 respectively (see appendix 11) (KSA, 2018). Overall mortality rate shows an increasing trend across all municipalities and the same observation can be made for the aggregate number of deaths in Kosovo (see appendix 11). However, in most years the highest number of deaths reported remains in Prishtina. Albeit there are a number of factors related with the increase in the number of deaths in Prishtina such as the high number of people in the city and the continuous increase of migration from other cities in the capital, another factor that one can pinpoint as the cause of the increased mortality in Prishtina is its proximity to Obiliq, hence its exposure to environmental pollution.

Besides the increase in the number of deaths in Kosovo, another salient issue has been the low average age of death, especially in some cities which are exposed to environmental pollution. In 2016 the average age of death in Prishtina was 66.2 whereas in other cities, which are less exposed to such pollution, for instance Peja, the average age of death was 71.0 (see appendix 12) (KSA, 2017). Despite the differences between cities, the average age of death, as we can see in graph 2, in Kosovo has increased from 2014, 68 years, to 69 years in 2017. But cities such as Prishtina or Zvecan have shown rather low average ages of death which may point towards the high air pollution in Prishtina and high heavy metals', especially lead, contamination in Zvecan, as possible explanations for the low average age of death in the two cities (see appendix 12).



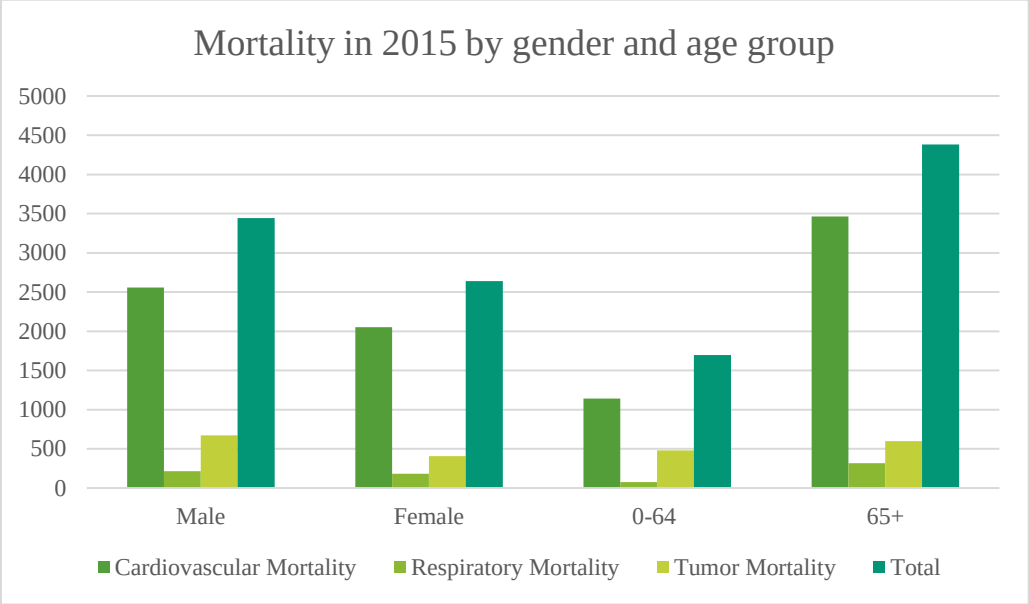
Graph 2) Average age of death in Kosovo from 2014-17

Exposure to environmental pollution increases the incidence but also mortality from cardiovascular, respiratory diseases and cancer. In graph 3, we can see that morality rate in Kosovo from 2006 to 2015 from cardiovascular diseases shows an increasing trend; from tumors (including malign tumors thus cancer) a slightly increasing trend; whereas from respiratory diseases a constant trend. In addition, according to KSA data, lung cancer and ischemic heart disease seem to be the two top diseases that are most likely to cause death followed by different types of respiratory diseases.



Graph 3) Mortality in Kosovo for 9 year from different NCDs

Going into specifics, the latest data show that mortality rate by respiratory, cardiovascular diseases and tumors is higher among men than among women (see graph 4) which can be explained by the fact that men are usually the ones (culturally) responsible for earning an income in the country; thus, they are more exposed to outdoor air pollution than the rest of the population.

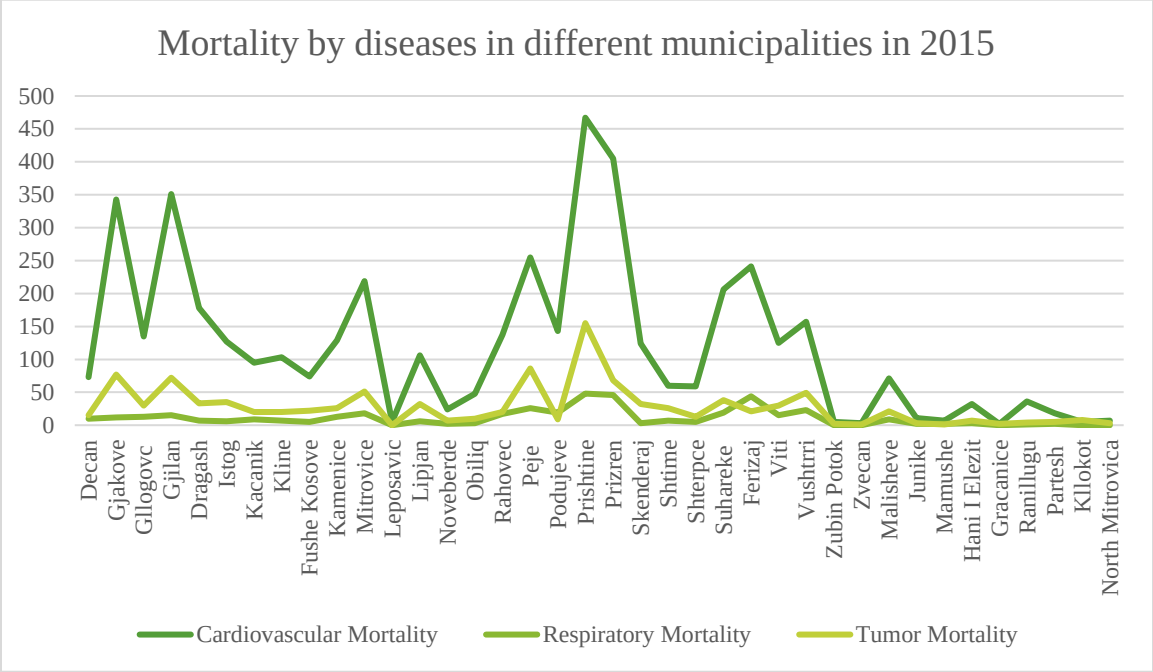


Graph 4) Mortality in Kosovo in 2015 by age group and gender from different NCDs

Another very vulnerable part of the society to the incidence and death from these NCDs are the elderly, people above 65 years old. From Graph 4 we see that the prevalence and mortality from these diseases is higher among the elderly in Kosovo than those between 0-64 years of age.

Nevertheless, such observations on the number of those suffering and dying from such diseases based on the gender and age group of people does not point to a possible linkage. Hence, in order to investigate the link between environmental pollution and mortality a researcher would need data on the number of those that have died from these NCDs from different municipalities because different cities deal with different levels of environmental pollution. From graph 5 we see that amongst all municipalities, Prishtina stands out as the city with the highest mortality rate from these three groups of diseases; however, this merely points towards a possible correlation between Prishtina's high level of air pollution and the death from various NCDs because of the

absence of epidemiological studies which statistically might link air pollution with mortality rates.



Graph 5) Mortality from different NCDs in Kosovo in 2015 in different municipalities

Another possible link between air pollution and morality from NCDs is seen when we make a comparison between Prishtina, which is very close to the power plants, and Peja which the furthest city from Kosovo A and B and simultaneously is very close to Rugova mountains (see appendices 14 & 15). When we analyze these two cities, we can see a great discrepancy between the number of people that have died from cardiovascular, respiratory diseases and tumors in Peja and Prishtina from 2012 to 2015. The difference is not very vast for deaths from respiratory diseases; however, it is striking for deaths from cardiovascular diseases where the number of those dying from these diseases is much higher in Prishtina than in Peja. Hence, this discrepancy in mortality between these two cities indicates a possible link between the level of exposure of citizens to air pollution and death from various diseases.

Nonetheless, despite the increasing number of deaths and the increase in the number of those dying from cardiovascular, respiratory diseases and cancer, and simultaneously the increase in the level of $PM_{2.5}$, PM_{10}, O_3, SO_2, NO_2 and CO, it is rather an educated guess to say that there is

a correlation between the increased level of air pollution in the country and the increased mortality rate from NCDs. Subsequently, to show a causational link between the two, epidemiological studies are necessary. These studies, though, are very hard to conduct in Kosovo because of the lack, the unreliability and poor presentation of morbidity and mortality data, and to some extent of air pollution data. Therefore, the following section provides a detailed analysis of the data that are available, the existing gaps in these data, and the unreliability of the information per se.

6.3. Analysis of Data in Kosovo

The results of this section are based both on an analysis of various reports published by Kosovar institutions (Table 7) and interviews with numerous actors.

Reports	# of Reports	# of Years Covered	Institution
Causes of Death Reports	5	2006-2015	KSA
Mortality Reports	11	2007-2017	KSA
Health Reports	14	2004-2017	KSA
Air Pollution Reports	8	2006-2017	KEPA

Table 7) Various reports analyzed containing environmental, mortality and health data

6.3.1. Causes of Death Reports

Data regarding causes of death in Kosovo are published by KSA. There are five reports in total. The first two reports for the years 2006-2009 were published when KSA was operating under the Ministry of Public Administration whereas the last three reports were published when this agency was functioning under the Office of the Prime Minister.

Presentation of Data

Each of these five reports follows the same structure, hence it is not hard to find the information one might be looking for each year because one has an idea in which section of the report the information can be found. However, there are differences within each report and between the reports (2006-2011 versus 2012-2015) when it comes to data specifics and how these data are arranged. More specifically, 2006-2011 reports lack data on the number of deaths divided by

group of disease then by municipality; or, they lack further subdivided data that the last two reports have, such as the number of deaths divided by cause of death then by age and gender, as well as subdivided data on more age groups as will be explained below. Another problem is how information is arranged; so, there is no clear listing or arrangement of the data. For example, in some tables the groups of diseases change places, i.e., the groups of diseases are found listed differently (see example below).

Ranking	KNS - 10	Diagnosis	Number	%
...	…	…	…	…
6	P00-P96	Some states of origin in the perinatal period	133	3.9
7	V01-Y98	External causes of sickness and mortality	118	3.5
8	E00-E90	Diseases of the endocrine system, and nutritional and metabolism disorders.	28	0.8
9	Q00-Q99	Born malformations, deformities and chromosomal abnormalities	28	0.8
10	N00-N99	Diseases of the urogenital system	27	0.8
11	K00-K93	Diseases of the digestive system	24	0.7

Pic 1) Mortality by group of disease in 2014 (author's translation & compilation)

Ranking	KNS - 10	Diagnosis	Number	%
...	…	…	…	…
6	N00-N99	Diseases of the urogenital system	85	2.2
7	P00-P96	Some states of origin in the perinatal period[1]	70	1.8
8	K00-K93	Diseases of the digestive system	60	1.6
9	E00-E90	Diseases of the endocrine system, and nutritional and metabolism disorders.	58	1.5
10	G00-G99	Diseases of the nervous system	37	1.0

Pic 2) Mortality by group of disease in 2012 (author's translation & compilation)

From pictures 1 and 2 we can see the changes in data arrangement of deaths by groups of disease, which makes it rather difficult for the researcher to follow the data.

[1] Even after consultations with medical and public health specialists, the group of diseases KSA refers to in this section remains unclear; hence, the translation is a direct (word per word) one from Albanian

Data Availability

The five reports on causes of death are time-series data that contain information for 10 years (2006-2015). Each of the reports offers information on the total number and percentage of deaths; total deaths by cause of death divided by gender; deaths divided by group of disease on 100,000 inhabitants; deaths divided by 10 groups of diseases; deaths divided by diseases then by age groups; and other information on infant mortality and violent deaths.

The information regarding deaths is firstly divided by cause of death, which is the group of disease, and then these data are divided by age-groups, by gender, and in the last two reports by municipality. There is also some information regarding deaths by specific diseases such as asthma, ischemic heart disease and the like. Moreover, there are some disaggregated data where information regarding deaths is firstly divided by cause of death then by age group and at last by gender, which can be found in the last reports.

Differences within Reports

The reports are overall the same regarding the information they contain, however, there are some differences between the first three reports and the last two. First, the last two reports have data divided by more age groups (there is a reclassification of the age groups already present in previous reports and new age groups that we find only in these last reports) and then by gender. Second, the first three reports have population data which the last two do not. Third, the last two reports have data divided by municipality.

Firstly, the most disaggregated data are found only on the last two reports, for the period 2012-2015, and have information on mortality based on group of disease divided by age group and then subdivided by gender. This means that the first three reports, period 2006-2011, do not have these data. The first three reports only have data on mortality by group of disease divided by gender or age-group but not first by age and then by gender.

Disease Groups KNS - 10	Age groups		Total
	0-64	65+	
…	…	…	…
Diseases of the endocrine system, and nutritional and metabolism disorders E00-E90	13	48	61
Psychiatric and behavioral diseases F00-F99	3	1	4
Nervous system diseases G00-G99	14	9	23
Circulatory system diseases I00-I99	957	2508	3465
Respiratory system diseases J00-J99	86	157	243
Digestive system diseases K00-K93	23	32	55
Skin and subcutaneous tissue diseases L00-L99	0	1	1
Skeletal-muscular and connective tissue system diseases M00-M99	2	0	2
…	…	…	…

Pic 3) Example of subdivided data for the period 2006-2011(author's translation and compilation)

Group of disease	Age Groups																													
	Infant			1-9			10-19			20-29			30-39			40-49			50-59			60-69			70-79			80+		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…
Circulatory system diseases I00-I99	13	10	23	7	4	11	7	14	21	15	7	36	45	29	74	67	46	113	251	112	363	461	296	757	752	589	1341	606	665	1271
Respiratory system diseases J00-J99	1	1	2	1	0	1	1	0	1	0	1	1	1	2	3	0	3	3	17	10	27	22	10	32	57	34	91	33	33	66
Digestive system diseases K00-K99	0	1	1	0	0	0	2	0	2	2	1	4	2	2	4	4	2	6	10	9	19	10	16	26	16	8	25	14	11	25
Skin and subcutaneous tissue diseases L00-L99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	1	1	0	0	0
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…

Pic 4) Disaggregated data based on age group and then gender for 2012-2015 (author's translation and compilation)

From pictures 3 and 4 we notice that there is also another important difference between the reports for period 2006-2011 and those for 2012-2015. The former reports have data for two age groups: 0-64 and 65+; whereas the latter reports have data for ten age groups: infant, 1-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80+.

Secondly, the reports for 2006-2011 differ with those for 2012-2015 because the last two reports lack information regarding the overall population data such as total population, natality, mortality, mortality divided by infant mortality and the mortality amongst the other part of the population, population growth, marriages and divorces, which the first three reports have. These are also time-series data. Specifically, the report for 2006-2007 has population data for those two years and for the previous 4 years. The report for 2008-2007 has population data for 2008 and 2007 and for the previous 6 years. And the report for 2009-2010 has population data on the last 8 years.

Lastly, most of the data on mortality found in these reports are not divided based on region or municipality. Aggregated data are not divided by municipality in the reports for the years 2006-2011 (see Pic 5). The last two reports have information on the number and percentage of deaths divided by group of diseases and then municipality for the period 2012-2015 (see Pic 6).

Ranking	KNS - 10	Diagnosis	Number	%
1	I00-I99	Diseases of the circulatory system	2766	65.13
2	C00-D48	Tumors	546	12.86
3	P00-P96	Some states of origin in the perinatal period	221	5.20
4	J00-J99	Diseases of the respiratory system	203	4.78
5	R00-R99	Symptoms, signs and abnormal clinical and laboratory findings unclassified elsewhere	178	4.19
6	N00-N99	Diseases of the urogenital system	114	2.68
7	V01-Y98	External causes of sickness and mortality	74	1.74
8	E00-E90	Diseases of the endocrine system, and nutritional and metabolism disorders	66	1.55

Pic 5) Aggregated data on mortality by cause of death in Kosovo (author's translation)

Ranking	KNS - 10	Diagnosis	Deçani		Gjakova		Gllogovci		Gjilani		Dragashi	
			Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
1	I00-I99	Diseases of the circulatory system	66	53.2	283	73.1	102	52	226	62.1	139	65
2	C00-D48	Tumors	20	16.1	33	8.5	27	13.8	44	12.1	36	16.8
3	R00-R99	Symptoms, signs and abnormal clinical and laboratory findings unclassified elsewhere	20	16.1	22	5.7	18	9.2	49	13.5	14	6.5
4	J00-J99	Diseases of the respiratory system	1	0.8	6	1.6	16	8.2	10	2.7	6	2.8
…	…	…	…	…	…	…	…	…	…	…	…	…

Pic 6) Mortality by cause of death in different municipalities in Kosovo (author's translation)

There are also differences between the reports. For example, even the last two reports differ in some places with one another because the last report, period 2014-2015, has sometimes another group of disease added to the dataset or another municipality that the previous report did not have.

Lack of Data

Despite the information available in these reports, there is still a huge gap in data. All the reports lack disaggregated data in detail. The information that we can find in these reports is mostly aggregated data. The data might be in some cases divided by gender or age or both as already shown. However, there is lack of data for conducting an epidemiological study because the information needs to be further subdivided. To be able to perform a study on the linkages between environmental pollution and mortality in the country using longitudinal data, the information needs to be disaggregated in the form explained in data required for epidemiological studies section of this study (also see Fig 1).

The second problem related to further disaggregation of data is linked to the lack of data by specific diseases. The data found in these reports are regarding groups of diseases. Specifically, the information presented is aggregated, i.e. we have data on how many people have died in 2015 from cardiovascular diseases in Prishtina, but we do not have data on how many people have died from MI or heart attack in Prishtina in 2015. The following picture and specifically the red areas show the number of deaths in Prishtina by cardiovascular diseases, tumors and respiratory diseases.

Ranking	KNS - 10	Diagnosis	Rahoveci		Peja		Podujeva		Prishtina		Prizreni	
			Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
1	I00-I99	Diseases of the circulatory system	137	61.2	255	58.8	143	62.7	467	55.1	405	63.9
2	C00-D48	Tumors	20	8.9	86	19.8	9	3.9	155	18.3	68	10.7
3	R00-R99	Symptoms, signs and abnormal clinical and laboratory findings unclassified elsewhere	21	9.4	21	4.8	7	3.1	48	5.7	42	6.6
4	J00-J99	Diseases of the respiratory system	17	7.6	26	6	19	8.3	48	5.7	46	7.3
5	…	…	…	…	…	…	…	…	…	…	…	…

Pic 7) Mortality by group of disease subdivided by municipality (author's translation and compilation)

There is, however, some information about mortality by specific diseases and by gender but for the whole Kosovo. These data are divided by gender and then by the disease; for instance, the number of those that have died from asthma or ischemic heart disease. But this information is limited to some diseases. When we look at the cardiovascular diseases, there are mortality data that are divided by gender then by how many have died from ischemic heart disease or cerebrovascular disease, but not other cardiovascular diseases. The other cardiovascular diseases are only labeled as other heart diseases and are aggregated in one place (see Pic 8).

Type of Disease	KNS 10 Codes	Gender	Number of the dead
…	…	Total	…
		Male	…
		Female	…
Nervous system diseases	G00-H95	Total	55
		Male	37
		Female	18
Meningitis	G00-G03	Total	1
		Male	0
		Female	1
Circulatory system diseases	I00-I99	Total	3996
		Male	2224
		Female	1772
Ischemic heart disease	I20-I25	Total	497
		Male	299
		Female	198
Other heart diseases	I30-I133, I39-I52	Total	2331
		Male	1296
		Female	1035
Cerebrovascular disease	I60-I69	Total	976
		Male	537
		Female	439
…	…	Total	…
		Male	…
		Female	…

Pic 8) Data regarding death by specific disease (author's translation and compilation)

6.3.2. Mortality Reports

Reports about mortality in Kosovo have been published by KSA. There are 11 reports in total. The first four reports were published when the Agency was operating under the Ministry of Public Services whereas the last seven reports were published when the Agency was functioning under the Office of the Prime Minister.

Presentation of Data

All the reports have data on the number of deaths, deaths divided by gender, deaths based on municipality, deaths based on ethnicity, deaths divided by age groups, deaths based on the level of education of the deceased and data on infant mortality. All this information is presented in tables, but some of these data then are followed by graphs or charts.

The reports have consistency in the sense that the data are reported in the same way. They follow the same pattern therefore it is easier to find the information one is looking for because one knows in which part of the report these data are available. Nevertheless, there are sometimes minor differences in the arrangement of the data and tables, hence trying to find the data may not be so easy; still, all the reports contain the same data besides the last couple of reports where some new data such as average age of death were added.

Data Availability

The 11 reports about mortality in Kosovo contain time-series data for a period of 11 years. Each report has data on the respective year. The earliest data available are those for 2007 and the latest data are those for 2017. The first five reports have time-series population data and the earliest population data found in these reports are from 2002.

Overall the reports have information about the percentage of death and the cases of deaths in Kosovo. These mortality reports have aggregate and subdivided data. First, the information is given for the whole Kosovo regarding the number of deaths that year. Second, the cases of death are divided by municipality, by age groups, by ethnicity, by education and gender.

Municipality	Municipality where death occurred	%	Municipality as a permanent residence of the deceased	%
Deçan	88	1.0	152	1.6
Gjakovë	491	5.3	581	6.3
Gllogovc	159	1.7	282	3.0
Gjilan	446	4.8	517	5.6
…	…	…	…	…

Pic 9) Example how data are divided (by municipality) (author's translation & compilation)

In contrast to the reports regarding the causes of death, in mortality reports we find disaggregated data as well. For example, in these reports we find mortality data that are divided by education then by gender and then by age groups (see Pic 10). Another form of disaggregated data is that these mortality data are divided by ethnicity then by gender and finally by age groups.

Age group	Total	Gender		Education													
				No Education		Elementary school - not finished		Elementary school - finished		Secondary school		Post-secondary School		University		Unknown	
				Gender													
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
14 or less	253	147	106	135	93	5	11	5	0	0	0	0	0	0	0	2	2
15-19	23	16	7	0	1	1	0	4	2	6	3	0	0	0	0	5	0
20-24	57	36	23	3	2	2	2	1	4	19	10	0	0	1	1	8	4
25-29	52	26	26	1	0	0	2	1	5	17	11	0	1	0	1	7	5
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…

Pic 10) Example of the level of disaggregation of data (author's translation & compilation)

Differences in Mortality Data

Although all reports provide the same information in the same structure there are some differences between reports.

First, the reports from 2013-2017 have data on the average age of death whereas the reports from 2012-2017 have more detailed information regarding deaths outside Kosovo. Both groups of data are divided by gender, municipality, and ethnicity. On the contrary, the reports from 2009-2011 have data regarding deaths in Kosovo divided by ethnicity and municipality whereas reports from 2007-2008 do not have data regarding mortality outside Kosovo. Furthermore, the reports from 2007-2011 have population data such as total population, natality, mortality, mortality subdivided by infant mortality and the mortality amongst the other part of the population, population growth, marriages and divorces which the other reports do not have. These are time-series data. In addition, reports from 2007-2009 lack mortality data for the following municipalities: Juniku, Mamusha, Hani i Elezit, Gracanica, Ranillug, Partesh, Kllokot and North Mitrovica. The report for 2010 has data on Juniku, Mamush and Hani i Elezit but not the rest. The reports for the period 2011-2013 lack data only on North Mitrovica. However, the reports from 2014 to 2017 have data on all municipalities (see appendix 11).

Second, there are discrepancies within reports themselves regarding the number of deaths. For instance, in the mortality report of 2017 in one table we find that the number of deaths in Peja, Prishtina and Prizren was 625, 838 and 1061 respectively whereas in the following table the numbers change to 541, 817 and 944 for the respective municipalities (see Pic 11 & 12).

Municipality	Municipality where death occurred	%	Municipality as a permanent residence of the deceased	%
…	…	…	…	…
Rahovec	207	2.1	311	3.2
Pejë	640	6.6	625	6.5
Podujevë	201	2.1	365	3.8
Prishtinë	2034	23.8	838	8.7
Prizren	1013	10.5	1061	11.0
Skenderaj	142	1.5	240	2.5
…	…	…	…	…

Pic 11) Mortality data on one table in the 2017 report (author's translation & compilation)

	Gender		
Municipality	Total	Males	Females
…	…	…	…
Pejë	541	296	245
Podujevë	365	223	142
Prishtinë	817	436	381
Prizren	944	503	441
…	…	…	…

Pic 12) Mortality data on the other table in the 2017 report (author's translation & compilation)

Even the total number of deaths varies in these two tables. In the first table the total number of deaths is 9670 whereas in the second table the number is 8721. The same discrepancy is found in the reports for the period 2016-2012 but not in the reports for the period 2011-2007. The rest of the data in the reports for 2012-2017 are based on the mortality data drawn from the second table. Hence, the inconsistency in data exists only for the first two tables. Moreover, there is a difference within reports on the labeling of the age groups. In tables where mortality data are divided by municipality we find a coding of age groups as 1-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80+; whereas in tables where mortality data are disaggregated by age group, gender and then education the age groups are coded as follows: >14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-89, 90-99, 100+ (see Pic 13 & 14) .

Municipality	Gender			Age group									
	Total	M	F	Less than 1 year old	1-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80 or more
Deçan	138	84	54	6	0	0	1	3	6	17	25	29	51
Gjakovë	398	229	169	16	2	5	2	8	20	55	64	110	116
Gllogovc	215	134	81	13	2	1	3	7	11	23	50	69	36
…	…	…	…	…	…	…	…	…	…	…	…	…	…

Pic 13) Coding of age groups when mortality data are divided based on municipality (author's translation and compilation)

Age group	Total	Gender		Education													
				No Education		Elementary school - not finished		Elementary school - finished		Secondary school		Post-secondary School		University		Unknown	
				Gender													
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
14 or less	385	222	163	194	148	25	11	3	4	0	0	0	0	0	0	0	0
15-19	44	27	17	3	1	2	1	11	9	9	3	0	0	0	0	2	3
20-24	37	21	16	1	1	0	0	2	4	16	9	0	0	2	0	0	2
25-29	47	34	13	2	0	0	3	0	4	21	5	0	0	3	0	8	1
…	…	…	…	…	…	…	…	…	….	…	…	…	…	…	…	…	…

Pic 14) Coding of the age groups when mortality data are subdivided by education and gender (author's translation and compilation)

Third, there are also discrepancies between the data available in the Agency's website and the reports published by the Agency per se. The data available for extraction on the website, however, are much more limited than the data found in reports. The data in the website cover mortality data only from 2010 to 2017.

Source of Data	2010	2011	2012	2013	2014	2015	2016	2017
Website Mortality Data	7234	7556	7317	7135	7634	8202	8495	8721
Report Mortality Data	7234	7556	7839	7681	8237	8958	9246	9670

Table 8) Discrepancies in mortality data

Table 8 shows great divergences between the number of deaths reported in the website and those found in the reports. The number of deaths published in the website show that mortality is much higher than the mortality numbers presented in the reports. The gap is as big as more than 500 deaths from 2012 to 2017. In addition, when we compare the data extracted from the website and those published in the reports, we notice discrepancies between numbers of deaths by municipalities as well (see Appendix 11 & 13). For example, in the report for period 2016-2017 the number of deaths reported in Prishtina and Prizren was different. 960 deaths were reported in 2016 and 838 in 2017 in Prishtina whereas in Prizren the number of deaths was 945 in 2016 and 1061 in 2017 in the mortality reports. In contrast, the data extracted from the website show that the number of deaths was 928 in 2016 and 817 in 2017 in Prishtina whereas in Prizren it was 842 in 2016 and 944 in 2017. Nevertheless, besides the differences with one table presented in the beginning of the reports, the rest of the data that are extracted from the website and the rest of the information found in the other tables in the reports coincide.

Lack of Consistently Disaggregated Mortality Data

The data found in these mortality reports as well as the mortality data found in KSA's website are aggregated and divided by one or two variables. The data that we find in these reports are divided by municipality, or by age groups, by gender, by ethnicity and by education. Or we find some level of disaggregation of data as was already explained. However, there is a gap in

mortality data because thoroughly subdivided data in the specific order, explained in the data required for epidemiological studies section, do not exist. In other words, for the information to be useful in conducting an epidemiological study where a link is established between environmental pollution and increased mortality, mortality data needs to be firstly divided by municipality then by gender and then divided by age-groups. Moreover, having then these data divided by education offers an additional valuable variable because usually people that have lower levels of education are more exposed to environmental pollution and therefore have a higher mortality rate.

6.3.3. Health Reports

Health reports which contain data on healthcare sector in Kosovo were published by different institutions. There are fourteen reports in total. The first three reports were published by Statistical Office of Kosovo when it was operating under the Provisional Institutions of Self Government. One was published by the Statistical Office of Kosovo when it was under the Ministry of Public Services. Three others were published by Statistical Office of Kosovo when it was operating under the Ministry of Public Administration. The last seven reports were published by KSA when it was functioning under the Office of Prime Minister.

Presentation of Data

As with the other reports, these health data are presented through tables. The information that these reports have are more general data on say the number of the physicians employed in each clinic at UCCK, those employed at the national hospitals of Kosovo and some data on cardiovascular and malign diseases.

Some data throughout the reports are the same, however, there are great differences between reports. From year to year either we have new data introduced or as we go from one report to the other there are data missing which the last report had. Even the same information, for example the number of physicians employed in national hospitals, is hard for the reader to follow because the place of that information within the report continuously is changed. Namely, the way data are arranged changes from report to report. Other times the same data are hard to follow because the labeling of data has changed.

Hence, these differences between reports, missing or extra data, changes in the labeling of data and the way data are arranged, is more obvious between reports that have a greater difference in years. For example, the differences between the 2017 report are immense with the 2011 report and even greater with the 2005 report. Such great differences make these health reports the hardest for a reader to follow.

Data availability

The reports contain data regarding the healthcare sector and are time-series data in nature. These reports have data for the last 14 years. The earliest data available are from 2004 and the latest data published are for 2017.

Health reports have data on the number of people employed in the national hospitals in Kosovo, in UCCK, and in family medical centers. They have data on the number of people diagnosed with malign or benign diseases by age or municipality, thus aggregated data. Other data include the number of visits in the cardiovascular clinic or nephrology, the number of those infected with communicable diseases and as such. Nonetheless, even the few data available in these reports are aggregated data.

Type of Disease	Total	Females	Males
Malignant tumors of the lips, mouth cavity and laryngitis	117	0	73
Malignant tumors of the digestive organs	470	174	296
Malignant tumors of the respiratory organs and intrathoracular organs	353	65	288
Malignant tumors of the bones and joints	12	5	7
Melanoma and other malignant neoplasms of the skin	433	152	281

Pic 15) Number of those diagnosed with malign diseases in 2017 (author's translation)

An example of data for malign diseases can be depicted in Pic 15 which shows data on the number of people diagnosed in 2017 with malign tumors of the respiratory system. As can be seen these are aggregated data and we can find them either divided by gender or age group or municipality, but this is simultaneously the greatest level of disaggregation we can find in these reports. In addition, some data are available for the number of visits in the cardiovascular clinic. However, these data only show the type of medical examination performed but not the type of diseases with which the patient has been diagnosed (see Pic 16).

Designation	Number of visits
Echocardiography	5530
Ergometer	1640
Coronary catheterization	727

Pic 16) The data available for the visits in the cardiovascular clinic (author's translation)

Group of disease	Total		Total		Age groups											
					Up to 1		1-5		6-14		15-49		50-64		65+	
	N	%	M	F	M	F	M	F	M	F	M	F	M	F	M	F
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…
Circulatory system diseases I00-I99	121,667	8.4	43,430	78,237	21	22	113	78	221	226	8,372	20,325	13,017	29,573	21,686	28,013
Respiratory system diseases J00-J99	437,257	30.18	222,655	214,590	10,609	8,626	87,186	68,651	50,613	43,252	46,581	60,082	11,045	16,910	16,621	17,069
Digestive system diseases K00-K99	165,741	11.44	72,964	92,777	757	629	6,691	5,347	22,939	24,135	29,142	46,630	6,500	8,682	6,935	7,354
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…

Pic 17) Morbidity data available in the 2005 report (author's translation and compilation)

Furthermore, the reports published by Provisional Institutions of Self Government contain some data which are crucial for conducting epidemiological studies. These are morbidity data (see pic 17), however, they are still aggregated data. They are not divided by specific diseases, by municipality nor by education, but at least having aggregated data of this nature shows the level of morbidity in the country, data which are missing in the other reports, for the years 2007-2017.

Differences in Data

There are great differences between health reports. The greatest differences can be seen between 2004-2006, 2007-2013, and 2014-2017 reports. But there are also differences within these groups of reports as well.

There are differences between reports on how the data are presented, labeled or even availability or lack of data. Some reports, such as those for 2004-2006, have data on morbidity, number of abortions but lack data on the number of those diagnosed with malign and benign diseases or the number of visits in the cardiovascular clinic. Nevertheless, although there are some data regarding malign diseases in 2004-2006 reports, they still differ greatly from those in later years, 2017-2014 (see Pic 18 &19).

Cases of malign diseases	Total	Total		Up to 1 year old		1-5 years old		6-14 years old		15-49 years old		50-64 years old		65+ years old	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F
Primary level	3885	1303	2582	16	30	71	66	48	44	313	1568	422	633	433	241
Secondary level	462	278	184	1	2	5	5	8	3	67	94	86	40	111	40
Tertiary level	1148	534	614	8	7	5	3	7	16	109	336	207	148	198	104
Total	**5495**	**2115**	**3380**	**25**	**39**	**81**	**74**	**63**	**63**	**489**	**1998**	**715**	**821**	**742**	**385**

Pic 18) How data for malign diseases are represented in 2005 report (author's translation)

	Females	Males	Total
Malignant tumors of the lips, mouth cavity and laryngitis	37	50	87
Malignant tumors of the digestive organs	194	261	455
Malignant tumors of the respiratory organs and intrathoracular organs	55	411	466
…	…	…	…

Pic 19) How data for cancer are presented in 2014 report (author's translation & compilation)

Moreover, the coding of the variables between these two groups of reports changes. In the 2004-2006 reports the coding of the age groups is as follows: up to 1, 1-5, 6-14, 15-49 and so forth, whereas in the 2017-2014 reports the coding of the age groups is: 0-4, 5-9, 10-14, 15-19, and so on (see Pic 18 & 20).

Age groups	Total	Female	Male
0-4	4	1	3
5-9	2	0	2
10-14	8	4	4
15-19	12	8	4
20-24	30	16	14
25-29	28	12	16
30-34	45	26	19
35-39	88	54	34
40-44	154	109	45
…	…	…	…

Pic 20) How age group variable is coded in 2014 report (author's translation and compilation)

There are also differences between these two groups of reports with the 2007-2013 reports. In the 2017-2014 reports we find more data under the UCCK clinics which are not available in the 2007-2013 and 2004-2006 reports. Moreover, even if two groups of reports have the same table with the same label, the information within that table changes. For example, the information presented in the 2007-2013 reports regarding main activities of UCCK and even how this information is labeled and arranged is different from those in 2014-2017 (see Pic 21 & 22).

Clinic	Beds	Medication days	Days of medication					
			From previous period	Hospitalized	Released	At the end of the period	Undergone surgery	Births
Surgery	139	43024	1185	5096	5088	1193	3246	-
Orthopedy	102	22594	820	2170	2194	796	1394	-
Urology	24	5548	210	942	942	210	964	-
…	…	…	…	…	…	…	…	…

Pic 21) Data available, labeling and arrangement regarding main activities of UCCK in 2013 report (author's translation & compilation

Clinics	Beds	Medication days	Number of beds	Number of those that had surgery	Diagnostic visits	Special services	Capacity utilized
Clinic of Gynecology& Obstetrics	396	90073	18003	5846	58273	106492	62.3
Clinic of Dermatology	36	8650	849	-	9513	536	65.8
Abdominal Surgery Clinic	69	16629	2645	2183	2512	4090	66

Pic 22) Data available, labeling and arrangement regarding main activities of UCCK in 2017 (author's translation)

Finally, despite these huge differences between these three groups of reports, there are also differences within these groups as well. For example, in the 2017 report we lack data about the comparability regarding the activities of national hospitals which we find in a 2016 report. Another example is that the 2006 report, for instance, lacks data regarding the number of abortions whereas the 2005 report has that information.

Lack of Data

Health reports contain general data on the number of people that have visited each clinic over the years, have been operated in each clinic or as such. These are mostly aggregated data for the whole Kosovo and are not even divided by age, gender, education or municipality let alone be disaggregated. Some of the early reports have some data regarding morbidity, nevertheless, those data too lack disaggregation based on municipality and specific diseases.

Similar to the other data from KSA, the health reports suffer from lack of consistent and clearly presented data and most importantly these reports lack morbidity data altogether. Namely, for a researcher to be able to conduct an epidemiological study, they need to have data on the number of people that suffer from a specific cardiovascular or respiratory disease or lung cancer, then this number needs to be divided by municipality then by age, gender and education level, which these reports do not have.

6.3.4. Air Pollution Reports

The reports about air pollution in Kosovo are published by KEPA, which operates under the Ministry of Environment and Spatial Planning (MESP). There are eight reports in total. Four of these reports are specifically about air pollution whereas four others are about the environmental status of the country and contain a separate section about the air pollution situation in Kosovo. The Agency also publishes monthly and daily reports about the level of air pollution in the country.

Presentation of Data

The annual reports contain information on the level of air pollution and different pollutants. The data on the level of air pollution in the country are divided by regions where the monitoring

stations are: Prishtina, Prizren, Peja, Mitrovica, and Gjilan. These data are presented through tables and graphs, but there are great differences between reports in the presentation of data: some data that are available in one report are not available in the other; the labeling of the data changes from one report to the other; and the way information is arranged changes from report to report. For instance, in the 2017 report we see that the regions on a table are aligned differently compared to a 2015 report. This ad-hoc presentation makes these data rather hard to follow. The daily and monthly reports, on the contrary, are easier to follow although they too change the way data are presented; nevertheless, they always contain the same information and are presented through graphs and tables.

Data Availability

The eight annual reports encompass data for 11 years. The earliest data available are for 2006 whereas the latest data available are for 2017. The data regarding air pollution for the years 2006-2012 are available in environmental status reports whereas the data for 2013-2017 are also available in separate reports about the air pollution status of the country. The daily reports contain data for the level of air pollution in the country and different regions of Kosovo for the last two years, 2018 and 2017, whereas the monthly reports encompass data on the level of air pollution for the last five years, 2014-2018.

The four annual reports which have data on the environmental status of the country, including air, water, biodiversity and others, have limited data on the level of air pollution overall and the level of few air pollutants, PMs and SO_2, in the country. The other four annual reports which offer data on the air pollution status in the country have more detailed information on the level of air pollution in Kosovo and different regions as well as information on the level of different air pollutants. Specifically, these air pollution reports contain data on the average level of air pollution in the country; the average level of CO, NO_2, SO_2, O_3, PM_{10}, and $PM_{2.5}$ in Kosovo and different regions; the level of these pollutants in different months of the year in these areas; and the level of emissions released from power plants, Kosovo A and B, and two industrial complexes, Ferronikeli and Sharrcem. However, even these data that are available are not that reliable because there is a lot of data missing for different regions in different months, hence making the average not a reliable or correct one.

Monitoring Station	Months												2017 Average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
IHMK	64.7	30.8	18.5	8.2	2.97	2.8	*	*	*	23.9	44.1	37.9	26
Rilindja	66.2	39.2	25.8	13.8	1.7	2.2	16.5	*	*	23.4	40	36.7	26.55
…	…	…	…	…	…	…	…	…	…	…	…	…	…
Peje	*	*	*	*	*	*	*	18.1	19.7	14.5	28.6	15.2	19.22
…	…	…	…	…	…	…	…	…	…	…	…	…	…
Gjilan	*	*	*	*	*	19.2	*	*	12.6	*	11.8	51.1	23.67
Palaj	*	*	*	*	*	*	*	*	14.7	24.1	35.1	17.5	22.85
…	…	…	…	…	…	…	…	…	…	…	…	…	…

Pic 23) Data on the level of $PM_{2.5}$ in different regions during different months in 2017 (author's translation and compilation)

For instance, from Pic 23 we can see that the data for the level of $PM_{2.5}$ in Peja for the first seven months are not available, as such the average for 2017 for this region is not reliable. The same can be said for Gjilan, Palaj and other locations (also see appendix 39).

The daily reports offer data on the daily level of $PM_{2.5}$ and PM_{10} for each of the regions where the monitoring stations are whereas the monthly reports have data on the level of $PM_{2.5}$, PM_{10}, SO_2, NO_2, CO and O_3 in different regions.

Differences in Data

There are differences within the annual environmental status reports and the annual air pollution reports. The former reports have limited information on the air pollution status in the country whereas the air pollution reports offer more detailed information in this regard. Nevertheless, differences exist within environmental reports and air pollution reports themselves. Each report differs from the other because new data were added as the reports change from year to year.

When we compare the environmental status reports with air pollution reports, we see that the information that is present in the 2017 air pollution report is also present in the 2017 environmental pollution report. However, there are differences when comparing a 2018 environmental status report with one published in 2006-2007. The 2018 report offers more detailed information on the level of SO_2, NO_2, PM_{10}, $PM_{2.5}$, O_3 and CO and has a much wider monitoring system, 11 monitoring stations, than the one in 2006-2007 which had only 3

monitoring stations and measured only the level of SO_2 and PMs altogether. The same differences, or rather addition, in data can be seen between air pollution reports. For instance, the 2017 report on air pollution has detailed information on the level of SO_2, NO_2, O_3, CO, $PM_{2.5}$, and PM_{10}, how much of SO_2, NO_2, CO and PMs are released from power plants, Ferronikel and Sharcem, and what is the level of pollution from each of these emissions in different regions in Kosovo. A 2013 report, on the other hand, contains air pollution data merely on the level of emissions released from power plants, Ferronikel, and Sharrcem, and these data are limited to the level of overall emissions from Kosovo A and B, the level of NO_2 and SO_2 from Ferronickel, and the level of SO_2, NO_2 and CO_2 from Sharrcem whereas the data for PMs are aggregated and extracted from two monitoring stations.

Differences exist also within the daily and monthly air pollution reports. A monthly report for December 2018 has information on the level of SO_2, NO_2, PM_{10}, $PM_{2.5}$, O_3 and CO from different monitoring stations and shows the average value of these pollutants, the maximum value, the day when the allowable level was exceeded and how many days the acceptable standard was exceeded. On the other hand, a monthly report for February 2014 offers only information on whether the allowable level was exceeded for these pollutants and how many days within the month that level was exceeded. The daily reports for air pollution offer the same information but only differ in the way data are presented. In a daily report for 2018 data are presented through tables, in comparison with a daily report for 2017 in which the data were presented through graphs.

Besides the continuous addition of data from year to year and the differences in the way data are arranged and presented, the annual environmental status reports and air pollution reports, especially the monthly and daily air pollution reports, have the same information.

Lack of Data

The reports on the level of air pollution in the country also suffer from lack of data such as the following: lack of reliable averages, lack of monitoring stations and the like.

Although the monitoring stations do measure the level of air pollution continuously for 24 hours, these data are not recorded. The data for the level of air pollution are taken as a daily average

then aggregated to a monthly average and then to an annual average for each region (Personal Interview, 2019). Nevertheless, the hourly monitoring of air pollution is important because the level of air pollution changes during the day and citizens are exposed to different levels of air pollution at different hours of the day; therefore, the impact on human health is different depending on the level and timing of the exposure.

There are also lack of monitoring stations in Gjakova, Ferizaj and the majority of municipalities in the country and there is also lack of data from the existing monitoring stations in some regions such as Peja and others. Having data on the level of air pollution in regions such as Peja is salient because Peja has a very high average age of death and is less polluted compared to Prishtina. Therefore, having data on the level of air pollution in Peja is important for conducting epidemiological studies because the city/region can be used as a control group in comparison to Prishtina which can be used as an exposure group.

At last, there is lack of data in terms of the level of Hg, Cd, Fe, and other similar heavy metals in the air, which are released as a result of energy and industrial production (Personal Interview, 2019). The measurement of the level of these emissions is very important because of the devastating health impacts that these metals can have for human health even if they are present in very small amounts due to their cancerogenic features (Ferati, Kerolli-Mustafa, & Kraja-Ylli, 2015).

6.4. Joint Issues Regarding Data for Epidemiological Studies

Besides the specific issues regarding data coverage, presentation, availability and lack thereof, researchers in Kosovo face three other problems regarding morbidity, mortality and environmental pollution data, which are common for the three types of data per se:

- Unreliability of data
- Lack of cooperation between institutions
- Lack of expertise in dealing with data

These three problems, although slightly visible in literature, merely emanated from a thorough qualitative research with different institutions.

6.4.1. Unreliability of Data

Interviews with a representative of National Institute of Public Health of Kosovo (NIPHK) and KEPA, pointed out the issue of data unreliability. The problem with data in Kosovo for both health and environmental pollution is that these data only present a portion of the scope of problem.

The issue with unreliability of data can be concluded for mortality data in Kosovo by diseases for a 9-year period, where we have dramatic discontinues in the number of people that have died from lung cancer and ischemic heart disease (see appendix 16). Moreover, from the same appendix but also the other graphs mentioned in the section mortality in Kosovo, we witness interesting ups and downs on mortality trends. “The data that we report are those that we get from the hospitals that have reported them. However, the majority of the clinics and hospitals do not report the number of patients that suffer from specific diseases or that have been diagnosed with a disease to begin with. Hence, we know that in reality the numbers of those suffering from cardiovascular, respiratory diseases and cancer are much higher, but we report what we can” said the representative of NIPHK (Personal Interview, 2019). So, for instance, it has been reported that the number of people diagnosed with cancer in 2012 was 1588, but in reality the numbers are much higher according to NIPHK representatives.

The same issue of unreliability of data, although to a lower extent, can be observed for air pollution data published by KEPA. When we analyze the reports on air pollution we see that the averages of annual air pollution in some cities are derived from data for three or four months on air pollution in that city; once again pointing towards data unreliability. “The monitoring of air pollution data happens on a daily basis. Then those daily averages are aggregated to derive the monthly average from which then we get the annual average for a city. However, we only have 11 monitoring stations until now, and we lack stations in cities like Gjakova or Ferizaj so the data on air pollution are limited for the country. Also, we measure only five parameters but in order to have a more holistic picture of the extent of air pollution we need to measure more parameters, but this costs a great amount of money and we just do not have the funding for it” said the representative of KEPA (Personal Interview, 2019).

6.4.2. Lack of Cooperation between Institutions

Another great issue is the lack of cooperation between institutions. This is especially the case in the data gathering process for health data because the process is more hierarchical than the process of gathering data for air pollution. Both representatives from NIPHK emphasized the problems they face with data reporting because these are data that flow from different institutions such as family medicine centers, national hospitals and private hospitals. These centers are obliged, according to them, to report all the data they have on their new patients to the Institute, however, most of these centers do not fill out nor submit the necessary forms regarding NCDs (see appendices 40&41). They further claimed that there is lack of willingness from the Ministry of Health to put in place mechanisms that would ensure that such reporting happens as well as lack of willingness to implement the Healthcare System of Information. In addition, NIPHK reports all the data they gather to KSA which is responsible for the publishing of the data and making them readily available for the public. Hence, the interviewees state that the problem with the lack of data for the public regarding morbidity does not rely with the NIPHK but rather with KSA.

In addition, there is lack of cooperation between NIPHK and KEPA. This is because KEPA in their reports have a section that outlines the impact of environmental pollution that year on public health; however, the reporting is rather general and is done by the Agency's employees. For more accurate and detailed information in this section of the reports KEPA needs to cooperate with NIPHK in order to properly and correctly assess the scope of the impact that environmental pollution that year has had on public health on the same or previous year.

6.4.3. Lack of Expertise

The institutions responsible for data gathering lack labor that is specialized in the field of statistics. Namely, the departments responsible for data gathering and reporting have employees who are specialized in fields such as chemical engineering, different fields of medicine and the like. This then unveils one of the reasons behind the poor conditions of data that are available for the researchers. Even the small amount of data that these institutions have at their disposal are aggregated and the rest of the information is lost. For instance, the patient case data that are submitted to NIPHK are aggregated and the forms that the physicians have to complete, which

carry data from which longitudinal databases can be constructed, (see appendices 40&41) are thrown away after one or two years (Personal Interview, 2019). Hereafter, the databases formed are only those that contain aggregated data whereas databases that would have disaggregated data are not available nor possible because the patient case data are lost.

The same is the case with air pollution data. The data gathered are aggregated for a day and then a month; however, in order to address issues such as the health effects of air pollution or air pollution per se, a researcher needs to have data on an hourly basis. This means that the data on air pollution are also lost, or in this case are not gathered, and even those gathered are aggregated to merely give an average of the level of the pollutant in the air rather than providing information in which peak levels of the pollutant within the day can be depicted. Namely, for epidemiological but also environmental studies, ranges rather than averages are more important for assessing the issue of air pollution.

7.0. Recommendations

In order to be able to address the issue of high morbidity and mortality rates in Kosovo it is important to design evidence-based policies. As explained above this is problematic because of the lack of data for conducting epidemiological studies. Hereafter, policies that address the problem of data unavailability and unreliability should be enforced.

The following recommendations target the data problem for conducting epidemiological studies in the country; however, these are long to medium-term solutions or rather solutions which try to tackle the data issue in its roots:

- Organization of capacity-building activities
- Digitalization of healthcare system information
- Increasing the level of cooperation between institutions

These are time-consuming and structural changes which need to be enforced in order for future researchers to have data available for conducting studies of this nature. In the short-run, though, surveys conducted by the researcher him/herself; cooperation between researchers and physicians, who have built their own datasets over time, to share data with one another; or trying

to find funding from different organizations to conduct a more holistic data gathering process on the field by the researcher, would be some of the paths one can take to conduct a study of a similar nature.

7.1. Organization of capacity-building activities

Organizing capacity-building activities such as trainings for the employees of the responsible institutions for the gathering of the data is crucial to prevent the loss of data that is apparent in environmental and especially morbidity data. The issue of the lack of needed capacities in the public sector is a widespread phenomenon, especially in developing countries. For instance, in Kazakhstan the lack of analytical skills and other data-related skills was the top incompetency of the civil servants in the government (Suleimenova & Karamalyeva, 2018). Therefore, the government of Kosovo should invest in increasing the human and institutional capabilities for data gathering and organization if it wants to possess the starting point, the scope of the problem, for combating the issue of increased morbidity and mortality rates in the country (UNEP, 2005). Capacity-building activities which are necessary for the responsible institutions can fall into one of the following categories: building awareness, analytical capacity and/or decision-making capacity (2005). The government of Kosovo should be investing and engaging its employees on activities for building analytical capacities because the workers responsible for the gathering and organization of data lack the required skills for that job (Personal Interview, 2019; Personal Interview, 2019). Moreover, the majority of the interviewees, especially those from NGOs, emphasized the urgent need for having people with the appropriate skills in such departments as statistics when asked why there are lack as well as discrepancies in data (Personal Interview, 2019; Personal Interview, 2019).

Such investments in trainings or other capacity-building activities should come from the government of Kosovo because a majority of policies, especially environmental policies, which have been pushed forward by international actors have resulted in either failure of those policies or lack of implementation thereof (Obradovic-Wochnik & Dodds, 2015). As such, the government of Kosovo should be cooperating with different civil society organizations who have the expertise and can organize such trainings as part of their work. In return, the government can offer a seat at the table for these organizations when and where different decision-making issues

are discussed, which at the same time would increase civic participation and governmental transparency. Nevertheless, future research should be focused on assessing the level of capacities and training needs of these employees in order to be able to design specific polices and capacity-building activities that will be efficient and worth investing in (Suleimenova & Karamalyeva, 2018).

7.2. Digitalization of the healthcare system information

The other, complementary, policy for addressing the issue of data unreliability and unavailability is the digitalization of the information in the healthcare system. The healthcare sector in Kosovo still functions on pen and paper method of data gathering. "The physicians lack the needed infrastructure for keeping all records of all the patients they have which makes our job harder because working with computers is easier for us than working with pen and paper; but, at the same time we do not have to wonder what form of a treatment did the patient receive lately in cases when the patient has lost or did not bring all the documents needed in the visit" said the physicians from the clinics of pulmonology and oncology at UCCK (Personal Interview, 2019; Personal Interview, 2019). The digitalization of the information in the healthcare system would immensely reduce the issue of data gathering, organization and storage, but simultaneously it would decrease the physicians' time spent on a patient, which means they would be more productive (AHRQ, 2012). Moreover, the digitalization increases the efficiency of the workers in both sectors, the hospitals and the institutions, because the data transfer would be quick, automatic and the probability of losing data would be decreased greatly (2012).

Consequently, the government of Kosovo should invest in providing the infrastructure in hospitals for data gathering. Such investment, however, would be a fiscal burden to the country. Hence, a medium-term solution might be to provide limited infrastructure and have two or three employees work with data insertion until a more long-term solution is feasible in addition to implementing the strategy for the System of Health Information. However, although the System of Health Information was supposed to have been implemented for a period of time now, the implementation has been stagnant and the healthcare system in Kosovo is still functioning on a paper basis, which is the reason behind the unreliability of data and lack thereof, the representatives of NIPHK stated (Personal Interview, 2019; Personal Interview, 2019).

7.3. Increase the level of cooperation between institutions

Increasing the level of cooperation between institutions responsible for the gathering, organization and finally publication of data is necessary. The lack of data and especially the unreliability of environmental and health data are as a result of the lack of cooperation between institutions. The institutions responsible for submitting the patient data to institutions required to organize these data, do not finish such reporting. On the other hand, the institutions responsible for the publication of the data that they get from the institutions responsible for the organization of data, do not publish such information (Personal Interview, 2019). As a result of the lack of cooperation in the first case we have data unreliability and lack of data whereas in the second case we have lack of public transparency. Therefore, in order to fill such gaps in data and increase public transparency, the government of Kosovo should draft, but mostly importantly enforce, regulations that incentivize the hospitals and family medicine centers to report to NIPHK and should monitor the work of KSA to make sure that the data they are receiving from the Institute are published.

8.0. Conclusion

The extensive increase in the consumption of natural resources, within a limited natural base, worldwide, including Kosovo, have led to devastating externalities. High levels of air and water pollution, degradation and pollution of soil, and heavy metals' contamination, which lead to increases in the number of people diagnosed with NCDs such as respiratory, circulatory diseases and cancer and death from such diseases, are amongst the most important negative externalities of natural resource consumption. A vast literature thoroughly has studied these externalities and the relationship between the two, human health and environmental pollution, and has concluded that increases in the level of various pollutants such as PM_{10}, $PM_{2.5}$, O_3, NO_2, SO_2 and CO are positively correlated with COPD, pneumonia, cystic fibrosis, asthma, ischemic heart disease, heart attacks, MI and AMI, and lung cancer, amongst others, as well as death from these diseases.

In Kosovo, although the number of people diagnosed and dying from NCDs has been increasing rapidly in the recent years together with the acute increase in the level of environmental

pollution, such a link between the two is hard to establish. Conducting epidemiological studies in Kosovo where you try to statistically show a relationship between human health and environmental pollution is problematic because of the lack and unreliability of data as well as lack of transparency and cooperation from the governmental institutions to share such data. Even reports published that offer some data on the field of environment, morbidity or mortality, are questionable because these reports have numerous problems with discrepancies, presentation and coverage of data. Therefore, it is this extensive problem with availability, reliability and transparency of data that researchers face in Kosovo that makes it hard to document the scope and the impacts of environmental pollution in the country, which in return gives leeway to the current policymakers to drop this issue from the agenda because it lacks grounds upon which its salience can be anchored. The lack of proper epidemiological studies in Kosovo also provides a path for the policymakers to push forward other agendas such as the building of the new coal power plant, Kosovo C.

Therefore, in order to combat the issue of environmental pollution in Kosovo and subsequently that of increased morbidity and mortality rates in the country, it is essential to conduct epidemiological studies that illustrate the scope of the problem and help identify the points were the issue is the most prevalent. However, as explained in the analysis section of this study, it is very problematic to conduct such studies in the country because of the various issue with health, mortality, and environmental data. As such, there is an urgent need to first invest in capacity-building activities, which would help the civil servants gain the needed skills for data gathering and organization; digitalize the system of information in the healthcare system, which would decrease the probability of losing data; and increase the level of cooperation between institutions, which would address the issue of unavailability and unreliability of data.

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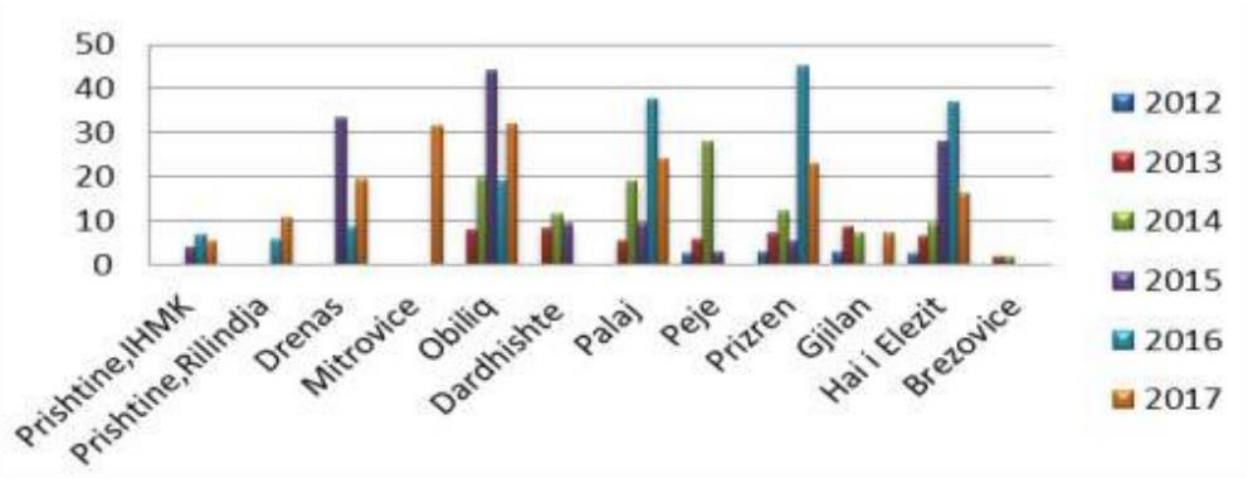
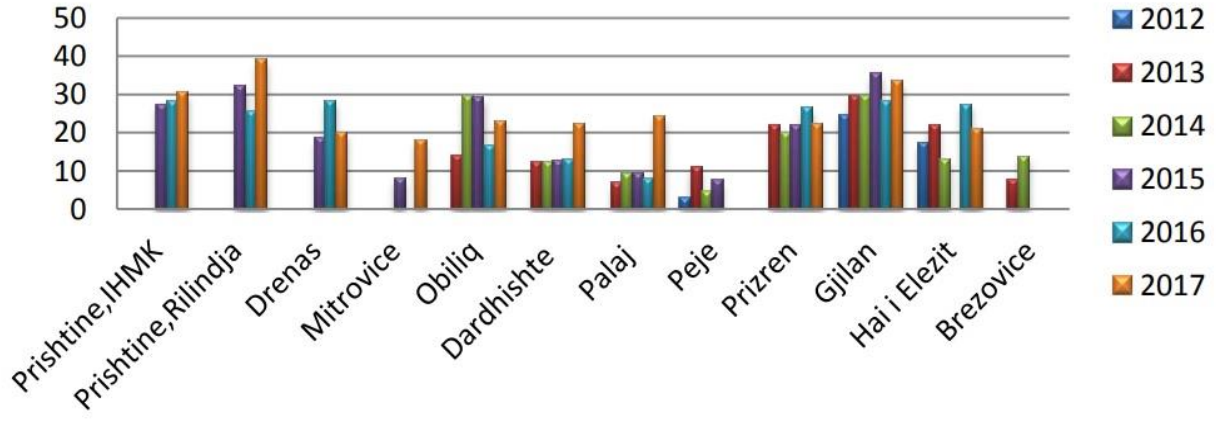
Appendix 1. The allowable levels of pollutants from EU Directive 2008/50/EC

Averaging period	Limit value
SO_2	
One hour	350 µg/m³, not to be exceeded more than 24 times a calendar year
One day	125 µg/m³, not to be exceeded more than three times a calendar year
NO_x	
One hour	200 µg/m³, not to be exceeded more than 18 times a calendar year
Calendar year	40 µg/m³
CO	
Maximum daily eight-hour mean	10 µg/m³
Pb	
Calendar year	0.5 µg/m³
PM_{10}	
One day	50 µg/m³, not to be exceeded more than 35 times a calendar year
Calendar year	40 µg/m³

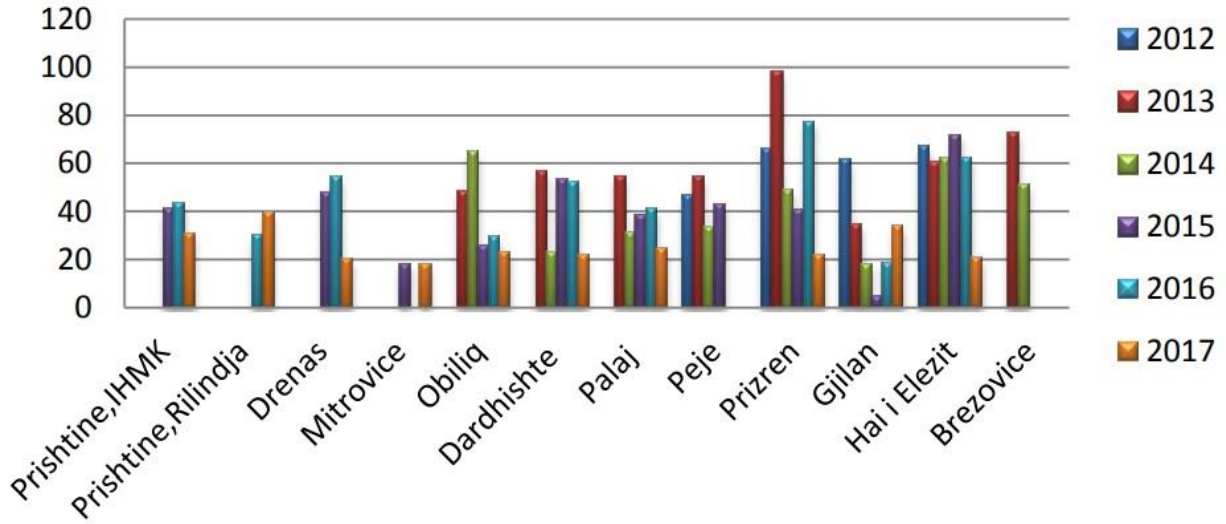
Appendix 2. Sulfur dioxide level over the period 2012-2017 in different regions



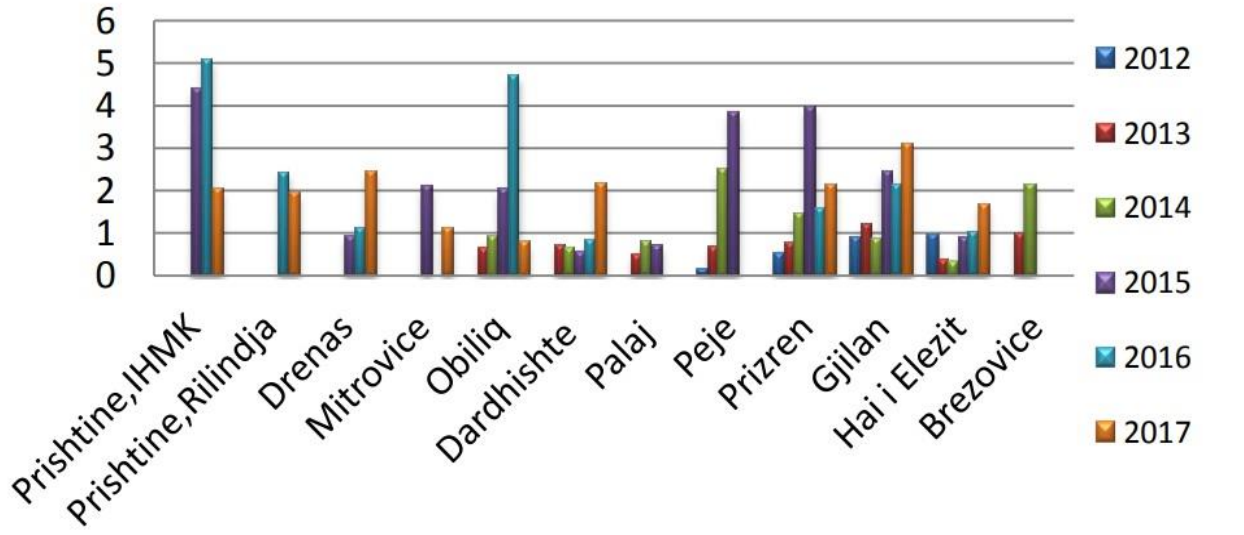
Appendix 3. Nitrogen dioxide level over the period 2012-2017 in different regions



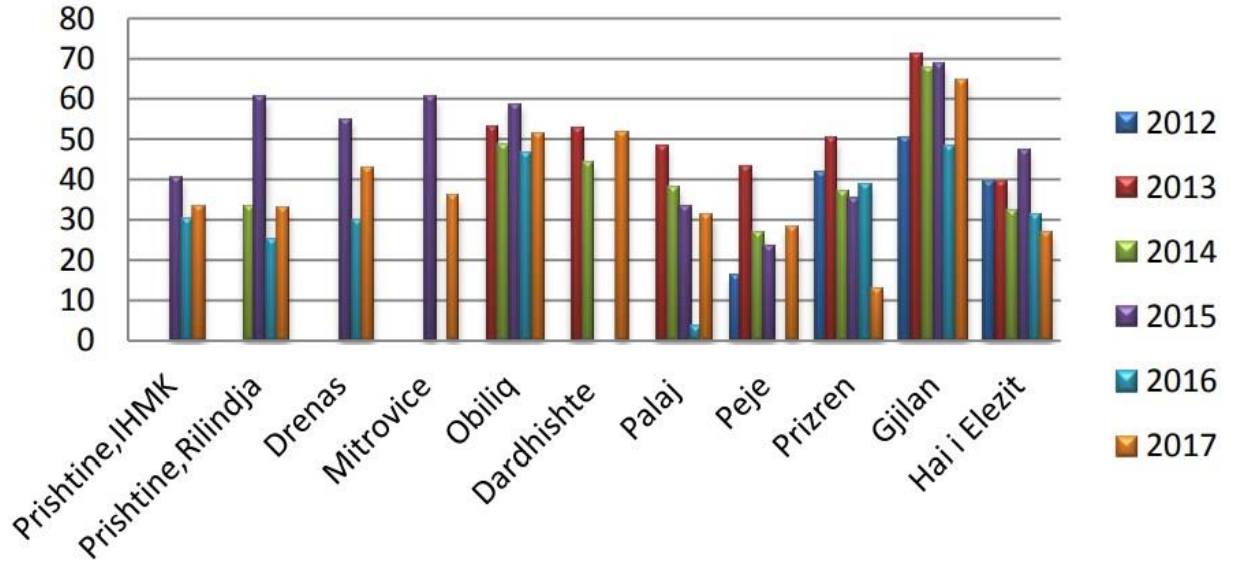
Appendix 4. Ozone level over the period 2012-2017 in different regions



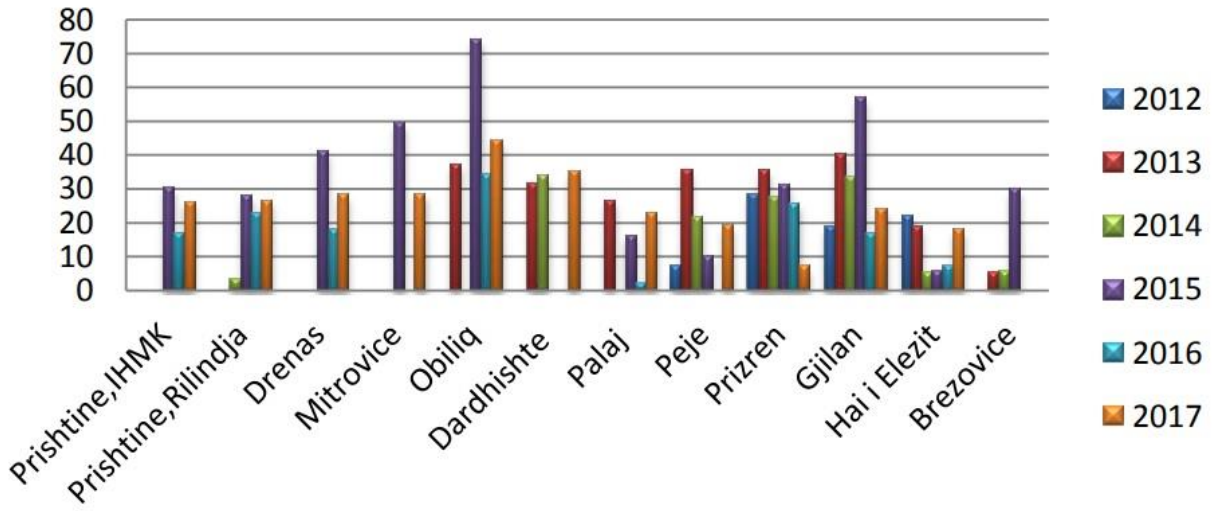
Appendix 5. Carbon monoxide level over the period 2012-2017 in different regions



Appendix 6. PM_{10} level over the period 2012-2017 in different regions



Appendix 7. $PM_{2.5}$ level over the period 2012-2017 in different regions



Appendix 8. The quality of water in the main water sources and the standard levels

Sanitary-biological water quality(mg/l)						
BOD_5—highest registered value	6.74 (2007) 7.22 (2008) 7.22 (2009)	19.8 (2007) 18.43 (2008) 15.1 (2009)	15.67 (2007) 11.97 (2008) 6.8 (2009)	approx. 6 (2007) approx. 5 (2008) approx. 5 (2009)	Pristine rivers Moderately polluted Municipal sewage[a]	< 1 mg/l 2–8 mg/l 20 mg/l
Dissolved oxygen—lowest registered value	6.6 (2007) 5.8 (2008) 5.7 (2009)	4.2 (2007) 2.2 (2008) 1.8 (2009)	6.1 (2007) 6.0 (2008) 7.0 (2009)	5.8 (2007) 6.0 (2008) 7.0 (2009)	No aerobic aquatic life Problematic for aerobic aquatic life	0–0.2 mg/l 0.2–6 mg/l
Highest heavy metal pollution of priority substances (mg/l)						
Cadmium	0.01	0.02	0.01	0.01	0.00045–0.0015[b] maximum allowable concentration depending on water hardness	
Lead	0.1	0.1	0.07	0.07	0.0072[b] annual average	
Nickel	0.9	0.2	0.2	0.2	0.02[b] annual average	

Appendix 9. Consent Form

Informed Consent Form for Social Science Research
R.I.T Kosovo (A.U.K)

Title of Project: *Conducting epidemiological studies in Kosovo – Feasibility*

Principal Investigator: Anila Abazi, RIT Kosovo Student
"Mustafë Hoxha" No: 76
Prishtinë
+38344174799; anilaa@auk.org

1. **Purpose of the Study**: The purpose of this research study is twofold. First, the purpose is to analyze the data available for non-communicable diseases in the country. Second, the purpose is to explore the relationship between non-communicable diseases and the level of environmental pollution in the country. Therefore, this study plans to find reveal what kind of data are necessary in order for a researcher to conduct epidemiological studies in Kosovo, show whether these data are available in Kosovo, and provide some recommendations for solving the problem.

2. **Procedures to be followed**: You will be asked to answer 6-10 questions during this interview.

3. **Duration**: It will take about 30 to 40 minutes for the interview to be completed.

4. **Statement of Confidentiality**: Your participation in this research is confidential. The information and data from this interview will be used only for academic and research purposes for my Honors project.

5. **Voluntary Participation**: Your decision to be part of this research is voluntary. You can stop at any time. You do not have to answer questions you do not want to answer.

You must be 18 or older to participate in this study. If you agree to take part in this research and agree to the information outlined above, please sign your name and indicate the date below.

You will be given a copy of this form for your records.

Participant Signature — Date: 7.03.2019

Person Obtaining Consent — Date: 07.03.2019

Appendix 10. Interview Questions

Physicians of Clinics

1. How are patient data gathered in your clinic?
2. Do you use digitalized or paper channels for patient history?
3. How are these data presented?
    a. Are they aggregate data or are there patient case data?
4. Where and for how many years are these data preserved?
5. Where do you send these data?
    a. Are these data sent to NIPHK?

Non-Governmental Organizations

1. Tell me something about what your NGO does? The activities it is involved in – advocacy, research, fieldwork or the like.
2. Based on your research, has Kosovo's environmental pollution status worsen in the last years?
3. Which are the consequences of environmental pollution?
4. Which cities and which groups of people are mostly suffering these consequences?
5. Do you think environmental and/or epidemiological studies can be conducted in Kosovo?
    a. What is the current situation in Kosovo regarding data needed for such studies?
6. Do you have any data available in this field? If yes, then what kind of data do you have, how are these data presented and how are they organized?
7. Is data gathering a problem and/or public institutions' cooperativeness to share such data?

Public Institutions

1. What kind of data are there available for morbidity and mortality?
2. How are these data gathered?
3. How are these data presented and organized?
4. What do these data contain?
    a. Are they aggregated data?
    b. What is their level of disaggregation?
5. Are patient cases data available? Or are such records archived somewhere?
6. Have you had requests from NGOs, universities or researchers for these types of data? If yes, then what kind of data did they ask for?
7. How can one interpret the discrepancies in the data published from different institutions?
    a. What is the level of cooperation with other institutions?

Appendix 11. Number of deaths in different municipalities in different years in Kosovo

Municipality	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Deçani	160	128	162	150	160	138	144	145	126	152	174
Gjakova	422	475	525	443	469	398	394	483	505	581	627
Gllogovci	167	194	229	224	233	215	199	236	236	282	249
Gjilani	432	496	466	488	501	417	397	453	498	517	579
Dragashi	213	221	218	245	220	218	182	234	228	281	340
Istogu	198	158	178	159	177	164	169	164	188	253	273
Kaçaniku	170	188	201	167	167	153	149	150	155	171	152
Klina	115	114	154	158	165	132	169	154	156	214	216
Fushë Kosova	120	116	124	144	169	141	105	161	178	200	199
Kamenica	212	207	189	203	184	193	190	191	203	240	259
Mitrovica	377	360	301	361	330	544	321	415	366	395	468
Leposaviqi	0	1	0	0	6	5	5	5	10	12	12
Lipjani	210	199	200	221	211	210	243	223	229	275	229
Novobërda	7	7	5	6	6	14	26	22	34	37	29
Obiliqi	90	92	93	94	91	104	93	76	99	95	86
Rahoveci	229	211	205	194	221	187	160	196	269	269	311
Peja	341	376	373	381	420	392	425	430	461	529	625
Podujeva	307	303	338	309	326	295	293	340	376	370	365
Prishtina	728	724	692	727	825	901	833	773	893	960	838
Prizreni	645	713	708	740	764	707	751	761	859	945	1061
Skenderaji	165	169	160	172	174	177	188	212	217	240	240
Shtime	94	84	93	116	85	96	91	120	118	126	114
Shtërpce	22	33	16	21	19	18	36	16	102	96	137
Suhareka	198	209	226	252	283	207	319	274	302	331	326
Ferizaji	420	396	446	465	499	424	401	502	452	574	544
Vitia	223	223	233	216	216	207	189	192	203	215	253
Vushtrria	237	286	310	306	319	339	325	334	329	398	394
Zubin Potoku	2	4	1	3	2	2	5	1	7	3	9
Zveqani	2	n/a	0	2	4	4	3	3	4	13	16
Malisheva	132	128	149	160	171	160	173	197	167	186	187
Juniku	n/a	n/a	n/a	10	14	11	22	16	19	22	28
Mamusha	n/a	n/a	n/a	5	12	6	14	14	32	27	18
Hani I Elezit	n/a	n/a	n/a	29	32	58	27	55	51	43	60
Graçanicë	n/a	n/a	n/a	n/a	0	4	7	5	5	13	9
Ranillug	n/a	n/a	n/a	n/a	11	10	14	19	35	54	62
Partesh	n/a	n/a	n/a	n/a	12	19	23	16	30	34	29
Kllokot	n/a	n/a	n/a	n/a	12	19	17	7	21	13	29
North Mitrovica	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8	10	36	77
Outside Kosovo	43	37	35	63	46	18	33	31	30	44	51

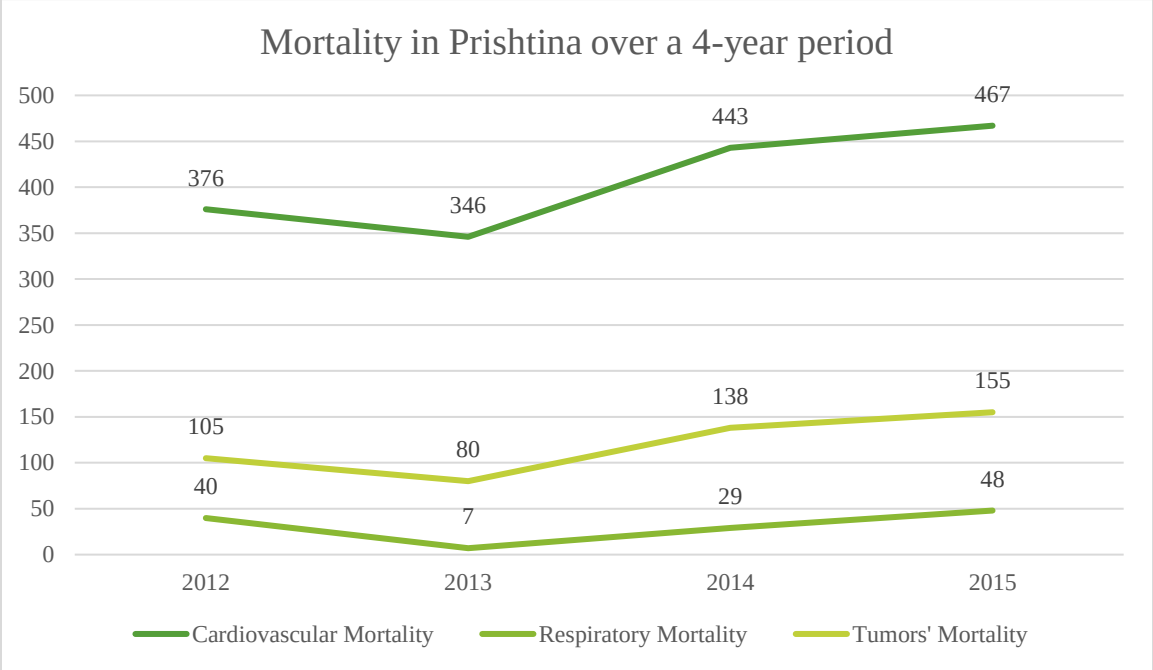
Appendix 12. The average age of death in different municipalities from 2013-17 in Kosovo

	2013	2014	2015	2016	2017
Deçani	69	69.1	71.7	69.7	70.2
Gjakova	68.7	67.4	68.1	69.5	71.5
Gllogovci	64.1	65.1	67.2	67	67.2
Gjilani	65.8	67.9	67.8	68.7	68.9
Dragashi	72.4	72.2	74.3	73.7	75.5
Istogu	66.2	67.8	71.2	71.2	70.8
Kaçaniku	66.6	69.3	70.8	67.4	70.2
Klina	67.4	67.8	69.3	67.3	68.8
Fushë Kosova	66.4	71.6	64.6	68.9	67
Kamenica	70.8	74.2	72.5	74.5	72.9
Mitrovica	64.2	67.9	66.1	68.4	67.4
Leposaviqi	54.4	57.4	56.3	58.1	63.2
Lipjani	60	64.9	65.9	67.2	67.6
Novobërda	60.2	72.4	75.6	69	78.5
Obiliqi	64.5	65.1	69.4	66.2	66.5
Rahoveci	68.5	66.3	71	70.2	70.1
Peja	66.6	68.4	70.4	71	70.4
Podujeva	63.3	65.4	63.7	69.5	66.3
Prishtina	61.8	65.3	66.1	66.2	67.3
Prizreni	68	68.9	68.8	71	70.3
Skenderaji	65.4	63.4	67.5	67.8	69.7
Shtime	65.2	65.1	67.4	66.7	68.3
Shtërpce	74.8	68.9	72.8	73.2	74.6
Suhareka	67.9	67.2	72.3	73	71.1
Ferizaji	65.8	65.8	67.6	68.1	67.4
Vitia	71	69.3	67	68.8	69.3
Vushtrria	65.6	66.8	66.8	71.3	68
Zubin Potoku	71.2	76	71.6	65	65.2
Zveqani	68.7	53.7	73	66.1	74.2
Malisheva	60.7	66	68.1	69.8	69.3
Juniku	72.7	78.3	72	72.4	74.8
Mamusha	71.6	68.6	72.5	68	59.1
Hani I Elezit	73.2	66.7	61.8	65.6	69.9
Graçanicë	71.4	70.6	72.4	64.6	66
Ranillug	70.6	77.5	78.9	77.5	75.5
Partesh	74.3	71.3	74.4	75.1	72.2
Kllokot	70.2	76	66.4	73.4	71.9
North Mitrovica	n/a	57.9	64.3	71.4	71.5

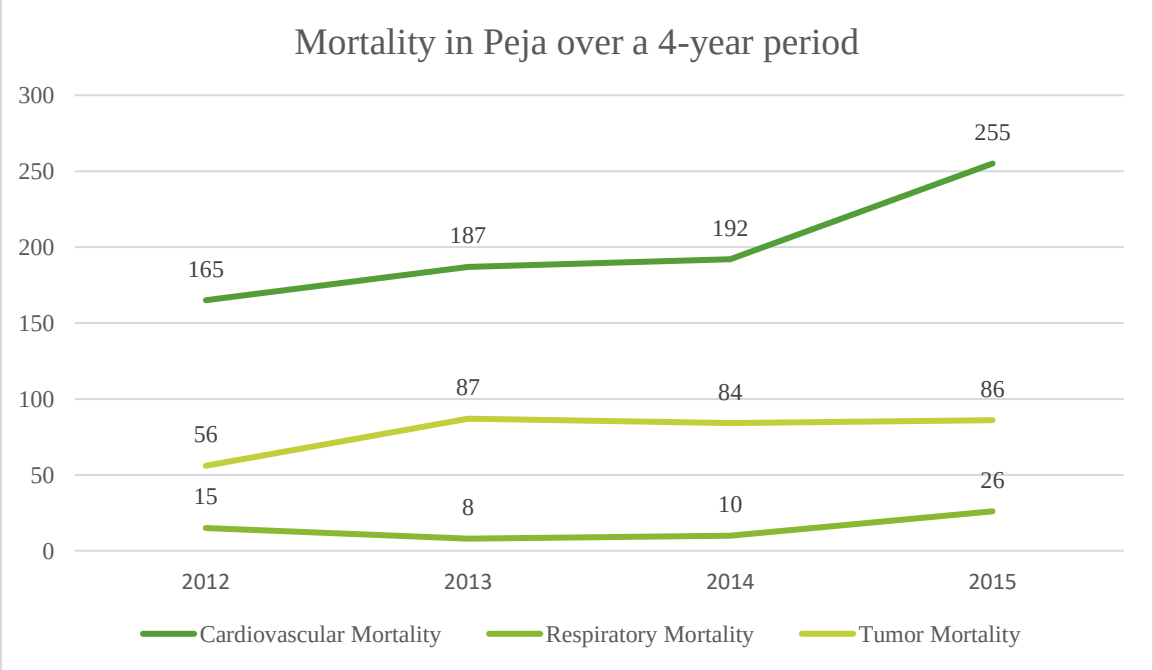
Appendix 13. Mortality data extracted from the website of KSA

	2010	2011	2012	2013	2014	2015	2016	2017
Deçan	150	160	138	144	145	126	143	155
Gjakovë	443	469	398	394	483	505	542	579
Gllogoc	224	233	215	199	236	236	267	236
Gjilan	488	501	417	397	453	498	470	512
Dragash	245	220	218	182	234	228	196	218
Istog	159	177	164	169	164	188	225	237
Kaçanik	167	167	153	149	150	154	163	143
Klinë	158	165	132	169	154	156	185	178
Fushë Kosovë	144	169	141	105	161	178	191	181
Kamenicë	203	184	193	190	191	203	212	230
Mitrovicë	361	330	544	321	415	366	365	444
Leposaviq	0	6	5	5	5	10	11	10
Lipjan	221	211	210	243	223	229	249	212
Novobërdë	6	6	14	26	22	34	33	29
Obiliq	94	91	104	93	76	99	90	81
Rahovec	194	221	187	160	196	269	255	294
Pejë	381	420	392	425	430	461	496	541
Podujevë	309	326	295	293	340	376	370	365
Prishtinë	727	825	901	833	773	893	928	817
Prizren	740	764	707	751	761	859	842	944
Skenderaj	172	174	177	188	212	217	226	224
Shtime	116	85	96	91	120	118	122	111
Shtërpcë	21	19	18	36	16	102	79	113
Suharekë	252	283	207	319	274	302	305	287
Ferizaj	465	499	424	401	502	452	520	492
Viti	216	216	207	189	192	203	195	218
Vushtrri	306	319	339	325	334	329	372	365
Zubin Potok	3	2	2	5	1	7	3	9
Zveçan	2	4	4	3	3	4	12	16
Malishevë	160	171	160	173	197	167	177	181
Junik	10	14	11	22	16	19	21	24
Mamushë	5	12	6	14	14	32	26	17
Hani I Elezit	29	32	58	27	55	51	42	55
Graçanicë	:	0	4	7	5	5	11	9
Ranillug	:	11	10	14	19	35	43	49
Partesh	:	12	19	23	16	30	32	29
Kllokot	:	12	19	17	7	21	13	18
Mitrovicë Veriore	:	:	10	:	8	10	28	61
E panjohur	:	:	:	:	:	:	:	:

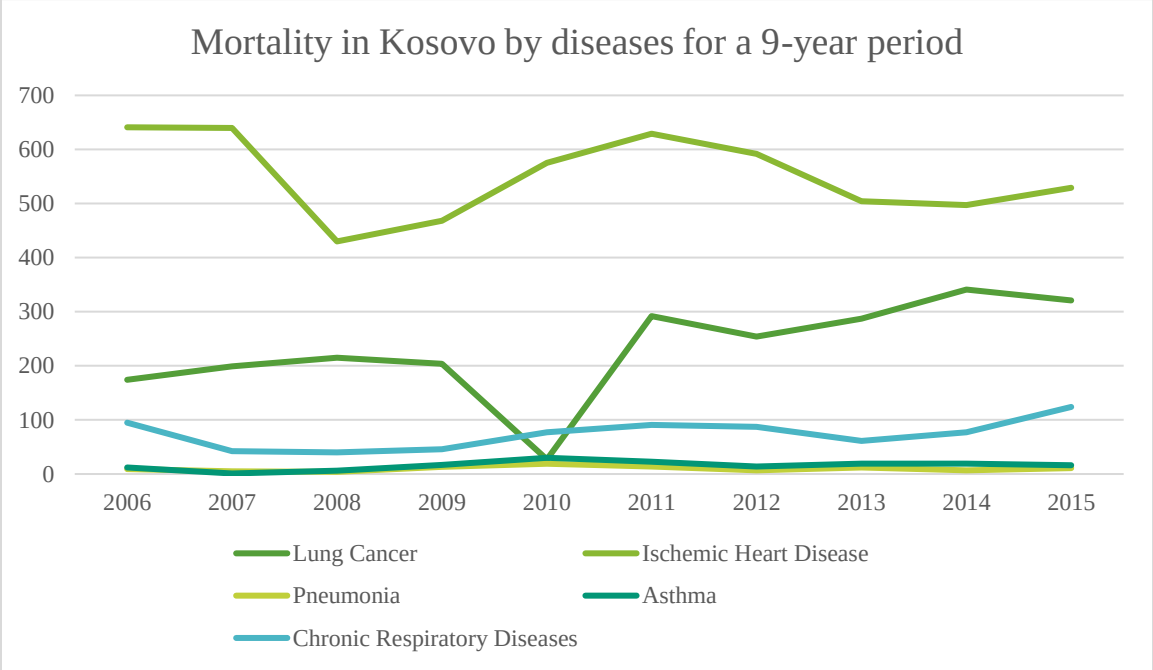
Appendix 14. Mortality in Prishtina for 4 years by different NCDs



Appendix 15. Mortality in Peja for 4 years from different NCDs



Appendix 16. Mortality in Kosovo by specific diseases for period 2006-2015



Appendix 17. Mortality by group of diseases in 2014 from the original report in Albanian

M e sh k u j

Rangimi	KNS - 10	Diagnoza	Numri	%
1	I00-I99	Sëmundjet e sistemit të qarkullimit të gjakut	2224	58.4
2	C00-D48	Tumoret	722	19.0
3	V01-Y98	Shkaktarët e jashtëm të sëmundëshmërisë dhe vdekshmerisë	185	4.9
4	R00-R99	Simptomet, shenjat dhe rezultatët jonormale klinike dhe laboratorike të paklasifikuara gjetiu	156	4.1
5	J00-J99	Sëmundjet e sistemit të frymëmarrjes	133	3.5
6	N00-N99	Sëmundjet e sistemit urogjenital	85	2.2
7	P00-P96	Disa gjendje me origjinë në periudhën perinatale	70	1.8
8	K00-K93	Sëmundjet e sistemit të tretjes	60	1.6
9	E00-E90	Sëmundjet endokrine, të ushqyshmërisë dhe metabolike	58	1.5
10	G00-G99	Sëmundjet e sistemit nervor	37	1.0

Appendix 18. Mortality by group of disease in 2012 from the original report in Albanian

M e sh k u j

Rangimi	KNS - 10	Diagnoza	Numri	%
1	I00-I99	Sëmundjet e sistemit të qarkullimit të gjakut	1888	56,0
2	C00-D48	Tumoret	518	15,4
3	R00-R99	Simptomet, shenjat dhe rezultatët jonormale klinike dhe laboratorike të paklasifikuara gjetiu	413	12,2
4	J00-J99	Sëmundjet e sistemit të frymëmarrjes	141	4,2
5	P00-P96	Disa gjendje me origjinë në periudhën perinatale	133	3,9
6	V01-Y98	Shkaktaret e jashtëm të sëmundëshmërisë dhe vdekshmërisë	118	3,5
7	E00-E90	Sëmundjet endokrine, të ushqyshmërisë dhe metabolike	28	0,8
8	Q00-Q99	Keqformimet e lindura, deformitetët dhe anomalitë kromozomale	28	0,8
9	N00-N99	Sëmundjet e sistemit urogjenital	27	0,8
10	K00-K93	Sëmundjet e sistemit të tretjes	24	0,7

Appendix 19. Subdivided data for the period 2006-2011 from one of the original reports in Albanian

Tab.9. Të vdekurit në Kosovë sipas grup-moshave dhe grupeve të sëmundjeve për vitin 2010

Grupet e sëmundjeve KNS - 10	Grup-mosha		Gjithsej
	0-64	65+	
Sëmundjet infektive dhe parazitare A00-B99	16	14	30
Tumorret C00-D48	370	384	754
Sëmundjet e gjakut dhe të organeve gjakformuese dhe çrregullimet e imunitetit D50-D89	1	1	2
Sëmundjet endokrine, të ushqyëshmerisë dhe metabolike E00-E90	13	48	61
Sëmundjet psikike dhe të sjelljës F00-F99	3	1	4
Smundjet e sistemit nervor G00-G99	14	9	23
Sëmundjet e sistemit të qarkullimit të gjakut I00-I99	957	2508	3465
Sëmundjet e sistemit të frymëmarrjes J00-J99	86	157	243
Sëmundjet e sistemit të tretjes K00-K93	23	32	55
Sëmundjet e lekurës dhe indit nënlekurorë L00-L99	0	1	1
Sëmundjet e sistemit skeletor-muskulor dhe indit lidhorë (M00-M99)	2	0	2
Sëmundjet e sistemit urogjenital N00-N99	20	56	76
Shtatëzania, lindja dhe lehonia (O00-O99)	0	0	0
Disa gjendje me origjinë në periudhen perinatale P00-P96	212	0	212

Appendix 20. Disaggregated data based on age group and then gender for 2012-2015 in Kosovo from an original report in Albanian

Tab.9. Të vdekurit sipas grup-moshave dhe grupeve të sëmundjeve për vitin 2014

Grupet e sëmundjeve KNS - 10	Grup-moshat																																	
	Foshnje			1-9			10-19			20-29			30-39			40-49			50-59			60-69			70-79			80+							
	M	F	GJ	M	F	GJ	M	F	GJ	M	F	GJ	M	F	GJ	M	F	GJ	M	F	GJ	M	F	GJ	M	F	GJ	M	F	GJ				
Sëmundjet infektive dhe parazitare A00-B99	1	2	3	0	0	0	2	0	2	0	0	2	0	0	0	4	1	5	8	5	13	7	11	18	4	7	11	4	3	7				
Tumorret C00-D48	0	0	0	4	5	9	9	2	11	8	6	19	15	26	41	45	51	96	142	88	230	210	97	307	222	85	307	69	57	126				
Sëmundjet e gjakut dhe të organeve gjakformuese dhe çrregullimet e imunitetit D50-D89	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	2	1	2	3	0	0	0	1	1	2	0	0	0				
Sëmundjet endokrine, të ushqyëshmerisë dhe metabolike E00-E90	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	4	2	6	10	16	26	30	21	51	12	10	22				
Sëmundjet psikike dhe të sjelljes F00-F99	0	0	0	0	0	0	0	1	1	0	0	1	0	1	1	0	0	0	0	1	1	0	0	0	1	0	1	0	1	1				
Sëmundjet e sistemit nervor G00-G99	1	0	1	1	0	1	2	1	3	0	3	3	2	1	3	3	2	5	4	1	5	12	2	14	7	5	12	5	3	8				
Sëmundjet e sistemit të qarkullimit të gjakut I00-I99	13	10	23	7	4	11	7	14	21	15	7	36	45	29	74	67	46	113	251	112	363	461	296	757	752	589	1341	606	665	1271				
Sëmundjet e sistemit të frymëmarrjes J00-J99	1	1	2	1	0	1	1	0	1	0	1	1	1	2	3	0	3	3	17	10	27	22	10	32	57	34	91	33	33	66				
Sëmundjet e sistemit të tretjes K00-K93	0	1	1	0	0	0	2	0	2	2	1	4	2	2	4	4	2	6	10	9	19	10	16	26	16	9	25	14	11	25				
Sëmundjet e lëkurës dhe indit nënlekurorë L00-L99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	1	1	0	0	0				
Sëmundjet e sistemit skeletor-muskulor dhe indit lidhorë M00-M99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4	0	0	0	0	0	0				
Sëmundjet e sistemit urogjenital N00-N99	0	0	0	0	1	1	0	1	1	1	1	2	1	0	1	8	2	10	8	9	17	25	15	40	26	27	53	16	13	29				
Shtatëzania, Lindja dhe Lehonia O00-O99	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Disa gjendje me origjinë në periudhën perinatale P00-P96	67	56	123	2	1	3	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Keqformimet e lindura, deformitetët dhe anomalitë kromozomale Q00-Q99	31	23	54	3	0	3	1	1	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Simptomet, shënjat dhe rezultatet jonormale klinike dhe laboratorike të paklasifikuara gjetiu R00-R99	1	0	1	2	2	4	1	2	3	3	5	6	1	3	4	10	6	16	15	10	25	32	22	54	46	22	68	45	40	85				
Lëndimet, helmimet dhe pasojat tjera nga agjentët e jashtëm S00-T98	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0				
Shkaktarët e jashtëm të sëmundëshmërisë dhe vdekshmërisë V01-Y98	0	1	1	4	3	7	16	4	20	33	7	53	27	4	31	40	6	46	28	3	31	20	8	28	12	2	14	5	1	6				
Gjithsej me diagnozë - të koduara	**115**	**94**	**209**	**25**	**17**	**42**	**42**	**27**	**69**	**62**	**32**	**94**	**95**	**68**	**163**	**183**	**119**	**303**	**489**	**252**	**741**	**812**	**496**	**1308**	**1174**	**803**	**1977**	**809**	**837**	**1646**				

Appendix 21. Aggregated data on mortality by cause of death in Kosovo from an original report in Albanian

Tab. 6. Rangimi i 10 grupeve të shkaqeve të vdekjes në Kosovë në vitin 2006

Gjithsej

Rangimi	KNS - 10	Diagnoza	Numri	%
1	I00-I99	Sëmundjet e sistemit të qarkullimit të gjakut	2766	65,13
2	C00-D48	Tumoret	546	12,86
3	P00-P96	Disa gjendje me origjinë në periudhën perinatale	221	5,20
4	J00-J99	Sëmundjet e sistemit të frymëmarrjes	203	4,78
5	R00-R99	Simptomet, shenjat dhe rezultatet jonormale klinike dhe laboratorike të paklasifikuara gjetiu	178	4,19
6	N00-N99	Sëmundjet e sistemit urogjenital	114	2,68
7	V01-Y98	Shkaktarët e jashtëm të smundëshmërisë dhe vdekshmërisë	74	1,74
8	E00-E90	Sëmundjet endokrine, të ushqyshmërisë dhe metabolike	66	1,55

Appendix 22. Mortality by cause of death in different municipalities in Kosovo from an original report in Albanian

Tab. 20 Rangimi i 10 grupeve të shkaqeve të vdekjes sipas vendqëndrimit (komunës) në Kosovë, në vitin 2012

Rangimi	KNS 10	Diagnoza	Deçani		Gjakova		Gllogovci		Gjilani		Dragashi	
			Raste, %		Raste, %		Raste, %		Raste, %		Raste, %	
1	I00-I99	Sëmundjet e sistemit të qarkullimit të gjakut	66	53.2	283	73.1	102	52.0	226	62.1	139	65.0
2	C00-D48	Tumoret	20	16.1	33	8.5	27	13.8	44	12.1	36	16.8
3	R00-R99	Simptomet, shenjat dhe rezultatet jonormale klinike dhe laboratorike të paklasifikuara gjetiu	20	16.1	22	5.7	18	9.2	49	13.5	14	6.5
4	J00-J99	Sëmundjet e sistemit të frymëmarjes	1	0.8	6	1.6	16	8.2	10	2.7	6	2.8
5	P00-P96	Disa gjendje me origjinë në periudhën perinatale	5	4.0	11	2.8	9	4.6	11	3.0	5	2.3
6	V01-Y98	Shkaktarët e jashtëm të sëmundëshmërisë dhe vdekshmërisë	4	3.2	8	2.1	9	4.6	9	2.5	11	5.1
7	E00-E90	Sëmundjet endokrine, të ushqyëshmerisë dhe metabolike	1	0.8	5	1.3	6	3.1	5	1.4	2	0.9
8	K00-K93	Sëmundjet e sistemit të tretjes	1	0.8	2	0.5	3	1.5	0	0.0	0	0.0
9	N00-N99	Sëmundjet e sistemit urogjenital	2	1.6	2	0.5	2	1.0	4	1.1	0	0.0

Appendix 23. Mortality by groups of diseases subdivided by municipality from an original report in Albanian

Rangimi	KNS 10	Diagnoza	Rahoveci		Peja		Podujeva		Prishtina		Prizreni	
			Raste, %		Raste, %		Raste, %		Raste, %		Raste, %	
1	I00-I99	Sëmundjet e sistemit të qarkullimit të gjakut	137	61.2	255	58.8	143	62.7	467	55.1	405	63.9
2	C00-D48	Tumoret	20	8.9	86	19.8	9	3.9	155	18.3	68	10.7
3	R00-R99	Simptomet, shenjat dhe rezultatet jonormale klinike dhe laboratorike të paklasifikuara gjetiu	21	9.4	21	4.8	7	3.1	48	5.7	42	6.6
4	J00-J99	Sëmundjet e sistemit të frymëmarrjes	17	7.6	26	6.0	19	8.3	48	5.7	46	7.3
5	P00-P96	Disa gjendje me origjinë në periudhën perinatale	4	1.8	3	0.7	16	7.0	37	4.4	15	2.4
6	V01-Y98	Shkaktarët e jashtëm të sëmundëshmërisë dhe vdekshmërisë	7	3.1	7	1.6	5	2.2	10	1.2	14	2.2
7	E00-E90	Sëmundjet endokrine, të ushqyëshmerisë dhe metabolike	8	3.6	12	2.8	1	0.4	14	1.7	9	1.4
8	Q00-Q99	Keqformimet e lindura, deformitetët dhe anomalitë kromozomale	0	0.0	0	0.0	2	0.9	7	0.8	2	0.3
9	N00-N99	Sëmundjet e sistemit urogjenital	4	1.8	11	2.5	7	3.1	29	3.4	10	1.6
10	G00-G99	Sëmundjet e sistemit nervor	1	0.4	1	0.2	7	3.1	4	0.5	6	0.9
		Sëmundjet tjera	5	2.2	12	2.8	12	5.3	29	3.4	17	2.7

Appendix 24. Data regarding death by specific disease in 2014 in Kosovo from the original report in Albanian

LLOJI I SËMUNDJES	KNS 10 Kodet	Gjinia	Nr. i të vdekurve
Sëmundjet e gjakut dhe të organeve gjakformuese dhe çrregullimet e imunitetit	**D50-D89**	Gjithsej	**8**
		Meshkuj	4
		Femra	4
Sëmundjet endokrine	**E00-E90**	Gjithsej	**107**
		Meshkuj	58
		Femra	49
Sëmundjet e sheqerit	E10-E14	Gjithsej	**104**
		Meshkuj	56
		Femra	48
Sëmundjet psikike dhe të sjelljes	**F00-F99**	Gjithsej	**5**
		Meshkuj	1
		Femra	4
Çrregullimet mendore për shkak të përdorimit të alkoolit	F10	Gjithsej	**0**
		Meshkuj	0
		Femra	0
Qrregullimet mentale si shkak i përdorimit të substancave psikoaktive	F11-F16,F18-F19	Gjithsej	**0**
		Meshkuj	0
		Femra	0
Sëmundjet e sistemit nervort	**G00-H95**	Gjithsej	**55**
		Meshkuj	37
		Femra	18
Meningjiti	G00-G03	Gjithsej	**1**
		Meshkuj	0
		Femra	1
Sëmundjet e sistemit të qarkullimit të gjakut	**I00-I99**	Gjithsej	**3996**
		Meshkuj	2224
		Femra	1772
Sëmundjet iskemike të zemrës	I20-I25	Gjithsej	**497**
		Meshkuj	299
		Femra	198
Sëmundjet tjera të zemrës	I30-I33, I39-I52	Gjithsej	**2331**
		Meshkuj	1296
		Femra	1035
Sëmundjet cerebrovaskulare	I60-I69	Gjithsej	**976**
		Meshkuj	537
		Femra	439

Appendix 25. Example how data are divided (by municipality) from an original report in Albanian

Komunat	Komuna ku ka ndodhur vdekja	%	Komuna e vendit të përhershëm të të vdekurit	%
Deçan	88	1.0	152	1.6
Gjakovë	491	5.3	581	6.3
Gllogovc	159	1.7	282	3.0
Gjilan	446	4.8	517	5.6
Dragash	161	1.7	281	3.0
Istog	152	1.6	253	2.7
Kaçanik	123	1.3	171	1.8
Klinë	119	1.3	214	2.3
Fushë Kosovë	105	1.1	200	2.2
Kamenicë	152	1.6	240	2.6
Mitrovicë	232	2.5	395	4.3
Leposaviq	5	0.1	12	0.1
Lipjan	111	1.2	275	3.0
Novobërdë	31	0.3	37	0.4
Obiliq	36	0.4	95	1.0

Appendix 26. Example of the level of disaggregation of data from an original report in Albanian

Grup-moshat	Gjithsej	Gjinia		Përgatitja shkollore													
				Pa shkollë		Shkolla fillore e pa kryer		Shkolla fillore e kryer		Shkolla e mesme		Shkolla e lartë		Fakulteti		E panjohur	
				Gjinia													
		Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra
14 e më pak	253	147	106	135	93	5	11	5	0	0	0	0	0	0	0	2	2
15-19	23	16	7	0	1	1	0	4	2	6	3	0	0	0	0	5	1
20-24	57	34	23	3	2	2	2	1	4	19	10	0	0	1	1	8	4
25-29	52	26	26	1	1	0	2	1	5	17	11	0	1	0	1	7	5
30-34	72	48	24	5	2	0	2	1	2	28	10	0	1	3	1	11	6
35-39	75	43	32	2	3	0	2	5	6	24	16	0	0	2	1	10	4
40-44	119	77	42	1	1	1	2	7	16	53	15	1	2	1	0	13	6
45-49	213	127	86	3	2	0	8	19	31	72	35	1	0	3	0	29	10

Appendix 27. Mortality data on one table from an original report in Albanian

Komunat	Komuna ku ka ndodhur vdekja	%	Komuna e vendit të përhershëm të të vdekurit	%
Deçan	100	1,0	174	1,8
Gjakovë	575	5,9	627	6,5
Gllogovc	150	1,6	249	2,6
Gjilan	506	5,2	579	6,0
Dragash	178	1,8	340	3,5
Istog	152	1,6	273	2,8
Kaçanik	109	1,1	152	1,6
Klinë	113	1,2	216	2,2
Fushë Kosovë	112	1,2	199	2,1
Kamenicë	177	1,8	259	2,7
Mitrovicë	330	3,4	468	4,8
Leposaviq	5	0,1	12	0,1
Lipjan	115	1,2	229	2,4
Novobërdë	30	0,3	29	0,3
Obiliq	35	0,4	86	0,9
Rahovec	207	2,1	311	3,2
Pejë	640	6,6	625	6,5
Podujevë	201	2,1	365	3,8
Prishtinë	2304	23,8	838	8,7
Prizren	1013	10,5	1061	11,0
Skenderaj	142	1,5	240	2,5

Appendix 28. Mortality data from the other table from the same report in Albanian

Komunat	Gjinia			Vendi ku ka ndodhur vdekja			Përkatësia etnike					
	Gjithsej	Meshkuj	Femra	Në maternitet apo spital	Në shtëpi	Vend tjetër	Shqiptar	Serb	RAE[3]	Boshnjak	Turk	Tjetër
Deçan	155	90	65	62	90	3	154	0	0	1	0	0
Gjakovë	579	309	270	197	369	13	570	2	6	1	0	0
Gllogovc	236	123	113	97	132	7	235	0	0	1	0	0
Gjilan	512	277	235	234	271	7	482	28	1	1	0	0
Dragash	218	118	100	47	166	5	137	0	0	81	0	0
Istog	237	137	100	84	148	5	217	8	4	7	0	1
Kaçanik	143	86	57	49	90	4	143	0	0	0	0	0
Klinë	178	108	70	68	105	5	171	1	6	0	0	0
Fushë Kosovë	181	83	98	76	104	1	169	2	8	2	0	0
Kamenicë	230	134	96	61	165	4	194	33	1	2	0	0
Mitrovicë	444	262	182	247	192	5	422	13	4	5	0	0
Leposaviq	10	7	3	6	3	1	1	9	0	0	0	0
Lipjan	212	130	82	98	113	1	207	3	2	0	0	0
Novobërdë	29	16	13	2	25	2	7	22	0	0	0	0
Obiliq	81	39	42	44	36	1	75	5	1	0	0	0
Rahovec	294	161	133	92	198	4	284	9	1	0	0	0
Pejë	541	296	245	240	295	6	493	6	10	32	0	0
Podujevë	365	223	142	162	198	5	365	0	0	0	0	0
Prishtinë	817	436	381	462	350	5	812	0	0	0	2	3
Prizren	944	503	441	705	236	3	801	6	1	101	35	0
Skenderaj	224	132	92	99	120	5	224	0	0	0	0	0
Shtime	111	55	56	43	65	3	110	0	1	0	0	0

Appendix 29. Coding of age groups when mortality data are divided based on municipality from an original report in Albanian

Komunat	Gjinia e Personit			Grup - mosha									
	Gjithsej	Meshkuj	Femra	Më pakse 1 vit	1-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80 e më shumë
Deçan	138	84	54	6	0	0	1	3	6	17	25	29	51
Gjakovë	398	229	169	16	2	5	2	8	20	55	64	110	116
Gllogovc	215	134	81	13	2	1	3	7	11	23	50	69	36
Gjilan	417	243	174	12	5	3	5	11	24	55	80	132	90
Dragash	218	114	104	7	3	1	4	6	13	20	25	72	67
Istog	164	96	68	4	1	1	2	6	8	26	30	48	38
Kaçanik	153	90	63	4	0	0	0	4	11	18	37	40	39
Klinë	132	79	53	3	0	1	1	3	3	10	32	39	40
Fushë Kosovë	141	84	57	7	1	0	3	2	9	19	30	45	25
Kamenicë	193	114	79	5	1	1	1	3	4	18	27	68	65
Mitrovicë	544	304	240	14	2	3	10	13	25	62	110	196	109

Appendix 30. Coding of the age groups when mortality data are subdivided by education and gender from an original report in Albanian

Grup-moshat	Gjithsej	Gjinia		Përgatitja shkollore													
				Pa shkollë		Shkolla fillore e pa kryer		Shkolla fillore e kryer		Shkolla e mesme		Shkolla e lartë		Fakulteti		E panjohur	
				Gjinia													
		Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra	Meshkuj	Femra
14 e më pak	385	222	163	194	148	25	11	3	4	0	0	0	0	0	0	0	0
15-19	44	27	17	3	1	2	1	11	9	9	3	0	0	0	0	2	3
20-24	37	21	16	1	1	0	0	2	4	16	9	0	0	2	0	0	2
25-29	47	34	13	2	0	0	3	0	4	21	5	0	0	3	0	8	1
30-34	63	48	15	1	2	2	1	6	4	30	8	1	0	2	0	6	0
35-39	99	56	43	1	2	3	4	8	17	37	14	0	1	0	0	7	5
40-44	152	85	67	2	7	3	5	12	22	50	26	0	1	6	0	12	6
45-49	219	137	82	6	5	11	12	19	18	83	31	4	0	0	0	14	16
50-54	340	226	114	6	8	13	15	38	35	121	42	6	2	9	1	33	11

Appendix 31. Number of those diagnosed with malign diseases in Kosovo from the 2017 original report in Albanian

Grupet e diagnozave	Gjithsej	Femra	Meshkuj
Tumoret malinje të buzë, zgavrres së gojës dhe laringut	117	0	73
Tumoret malinje të organeve të tretjes	470	174	296
Tumoret malinje të organeve të frymëmarrjes dhe organeve intratorakale	353	65	288
Tumoret malinje të kockave dhe nyjeve	12	5	7
Melanoma dhe neoplazmat malinje të tjera të lëkurës	433	152	281

Appendix 32. The data available for the visits in the cardiovascular clinic from an original report in Albanian

Emërtimi	Numri i vizitave
Ekokardiografi	5.530
Ergometri	1.640
Koronarografia	727

Appendix 33. Morbidity data available in the 2005 report in Albanian

Grupet e sëmundjeve sipas KN-10	Totali		Gjithsej		Grup mosha											
					deri 1vj.		1-5vj.		6-14vj.		15-49vj.		50-64vj.		mbi 65vj	
	N	%	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Sëmundjet infektive dhe parazitare (A00-B99)	57.147	3,94	28.648	28.499	1.280	1.149	11.742	9.733	6.312	6.063	6.502	7.929	1.331	2.010	1.481	1.615
Tumorët (C00-D48)	3.885	0,27	1.303	2.582	16	30	71	66	48	44	313	1.568	422	633	433	241
Sëm. e gjakut dhe org. hemopoetike dhe çrreg. e imunitetit (D50-D89)	17.465	1,21	6.155	11.310	435	417	3.436	2.715	956	985	757	5.630	250	952	321	611
Çrreg. endokrine ,te ushqyeshmeris dhe metabolizmit (E00-E90)	31.202	2,15	11.565	19.637	396	363	241	235	149	194	2.060	3.274	4.444	9.485	4.275	6.086
Çrregullimet psiqike dhe te personalitetit (F00-F99)	16.417	1,13	7.704	8.713	3	8	82	72	440	320	4.840	5.617	1.617	1.831	722	865
Sëmundjet SNQ (G00-G99)	18.048	1,25	6.499	11.549	25	20	215	155	664	593	3.518	7.469	1.144	2.144	933	1.168
Sëmundjet e syrit (H00-H59)	28.589	1,97	13.712	14.877	426	370	2.395	1.924	2.342	1.971	4.959	6.905	1.519	1.994	2.071	1.713
Sëmundjet e veshit dhe procesit mastoid (H60-H95)	22.447	0,00	11.047	11.400	661	596	3.066	2.717	1.896	1.843	3.090	4.038	1.067	1.307	1.267	899
Sëmundjet e sistemit te qarkullimit te gjakut (I00-I99)	121.667	8,40	43.430	78.237	21	22	113	78	221	226	8.372	20.325	13.017	29.573	21.686	28.013
Semundjet e sistemit te frymemarrjes (J00-J99)	437.247	30,18	222.655	214.590	10.609	8.626	87.186	68.651	50.613	43.252	46.581	60.082	11.045	16.910	16.621	17.069
Sëmundjet e sistemit te tretjes (K00-K93)	165.741	11,44	72.964	92.777	757	629	6.691	5.347	22.939	24.135	29.142	46.630	6.500	8.682	6.935	7.354
Sëmundjet e lëkures dhe indit nenlekuror (L00-L99)	55.653	3,84	27.977	27.676	912	823	5.924	5.084	5.549	4.809	11.321	12.814	1.939	2.369	2.332	1.777
Sëmundjet e sistemit lokomotor dhe indit lidhor (M00-M99)	84.751	5,85	32.422	52.329	97	179	253	210	842	810	16.959	26.744	6.665	13.771	7.606	10.615
Sëmundjet e sistemit urogjenital ((N00-N99)	75.184	5,19	17.599	57.585	216	195	1.897	1.989	1.856	2.918	7.346	40.595	2.525	7.337	3.759	4.551
Shtatzanija ,lindja dhe lehonia (O00-O99)	3.801	0,26	0	3.801	0	0	0	0	0	30	0	3.692	0	75	0	4
Gjendjet e caktuara qe rrjedhin nga periudha perinatale (P00-P96)	280	0,02	142	138	142	137	0	0	0	0	0	0	0	0	0	1
Komplikimet e lindura ,deformimet dhe anomalit kromozomale (Q00-Q99)	985	0,07	492	493	152	169	207	175	89	62	40	79	2	6	2	2
Simptomet ,shenjat,analizat dhe konstatimet abnormale klinike dhe laboratorike te paklasifikuara gjetiu (R00-R99)	55.055	3,80	21.504	33.551	519	519	4.101	3.458	3.958	3.775	8.092	17.268	2.075	4.747	2.759	3.784
Lëndimet,helmimet dhe disa nga pasojat tjera te shkaktuara nga fakt. e jasht. (S00-T98)	34.733	2,40	22.854	11.879	165	122	2.871	1.835	5.067	2.462	11.635	5.052	1.839	1.442	1.277	966
Shkaktarët e jashtëm të morbiditetit dhe mortalitetit (V01-Y98)	3.845	0,27	2.277	1.568	12	8	398	246	646	375	919	659	166	176	136	104
Faktoret qe ndikojne ne gjend.shënd. dhe kontakti me sherbim shendetesor (Z00-Z99)	210.520	14,53	79.784	130.736	6.079	5.274	14.510	11.506	10.042	8.224	24.603	73.504	11.078	19.012	13.472	13.216
Panjohur	4.030	0,28	1.899	2.131	91	89	402	358	493	435	568	827	149	231	196	191
Gjithsej N	1.448.690	100,00	632.632	816.058	23.014	19.745	145.801	116.554	115.122	103.526	191.617	350.701	68.794	124.687	88.284	100.845
Gjithsej %	100,0	-	43,7	56,3	1,6	1,4	10,1	8,0	7,9	7,1	13,2	24,2	4,7	8,6	6,1	7,0

Appendix 34. How data for cancer are represented in 2005 report from an original report in Albanian

Tabela 33: Kanceret sipas grup moshave dhe gjinisë

Rastet e sëmundjeve malinje	Totali	Gjithsej		Deri 1 vjet		1-5 vjet		6-14 vjet		15-49 vjet		50-64 vjet		65+ vjet	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F
Niveli primar	3.885	1.303	2.582	16	30	71	66	48	44	313	1.568	422	633	433	241
Niveli sekondar	462	278	184	1	2	5	5	8	3	67	94	86	40	111	40
Niveli terciar	1.148	534	614	8	7	5	3	7	16	109	336	207	148	198	104
Gjithsej	**5.495**	**2.115**	**3.380**	**25**	**39**	**81**	**74**	**63**	**63**	**489**	**1.998**	**715**	**821**	**742**	**385**

Appendix 35. How data for cancer are presented from the 2014 report in Albanian

Grupet e diagnozave malinje	Femra	Meshkuj	Gjithsej
Tumoret malinje të buzë, zgavrës së gojës dhe laringut	37	50	87
Tumoret malinje të organeve të tretjes	194	261	455
Tumoret malinje të organeve të frymëmarrjes dhe organeve intratorakale	55	411	466
Tumoret malinje të kockave dhe nyjeve	6	10	16
Melanoma dhe neoplazmat malinje të tjera të lëkurës	244	466	710
Tumoret malinje të indeve të buta mesotheliale	10	15	25
Neoplazma malinje e gjirit	523	13	536

Appendix 36. How age group variable is coded from a 2014 report in Albanian

Grupmoshat	Gjithsej	Femra	Meshkuj
0-4	4	1	3
5-9	2	0	2
10-14	8	4	4
15-19	12	8	4
20-24	30	16	14
25-29	28	12	16
30-34	45	26	19
35-39	88	54	34
40-44	154	109	45

Appendix 37. Data available, labeling and arrangement regarding main activities of UCCK from a 2013 report in Albanian

Klinika	Shtretër	Ditë mjekimi të lëshuar	Numri i pacientëve					
			Nga periudha paraprake	Të shtrirë	Të lëshuar	Gjendja në fund të periudhës	Të operuar	Lindje
Kirurgji	139	43.024	1185	5.096	5.088	1193	3.246	-
Ortopedi	102	22.594	820	2.170	2.194	796	1394	-
Urologji	24	5.548	210	942	942	210	964	-
Neurokirurgji	24	6.306	254	917	906	265	502	-
Gjinekologji Obstetrike	374	86.676	2612	34.693	34.753	2552	4271	10.294
Fiziatri	14	3635	139	215	211	143	-	-
Psikiatri	88	20.593	623	1.043	1.040	626	-	-
Pediatri	155	56.290	1923	6.317	6.330	1910	-	-
Neurologji	68	20.891	716	2.621	2.624	713	-	-

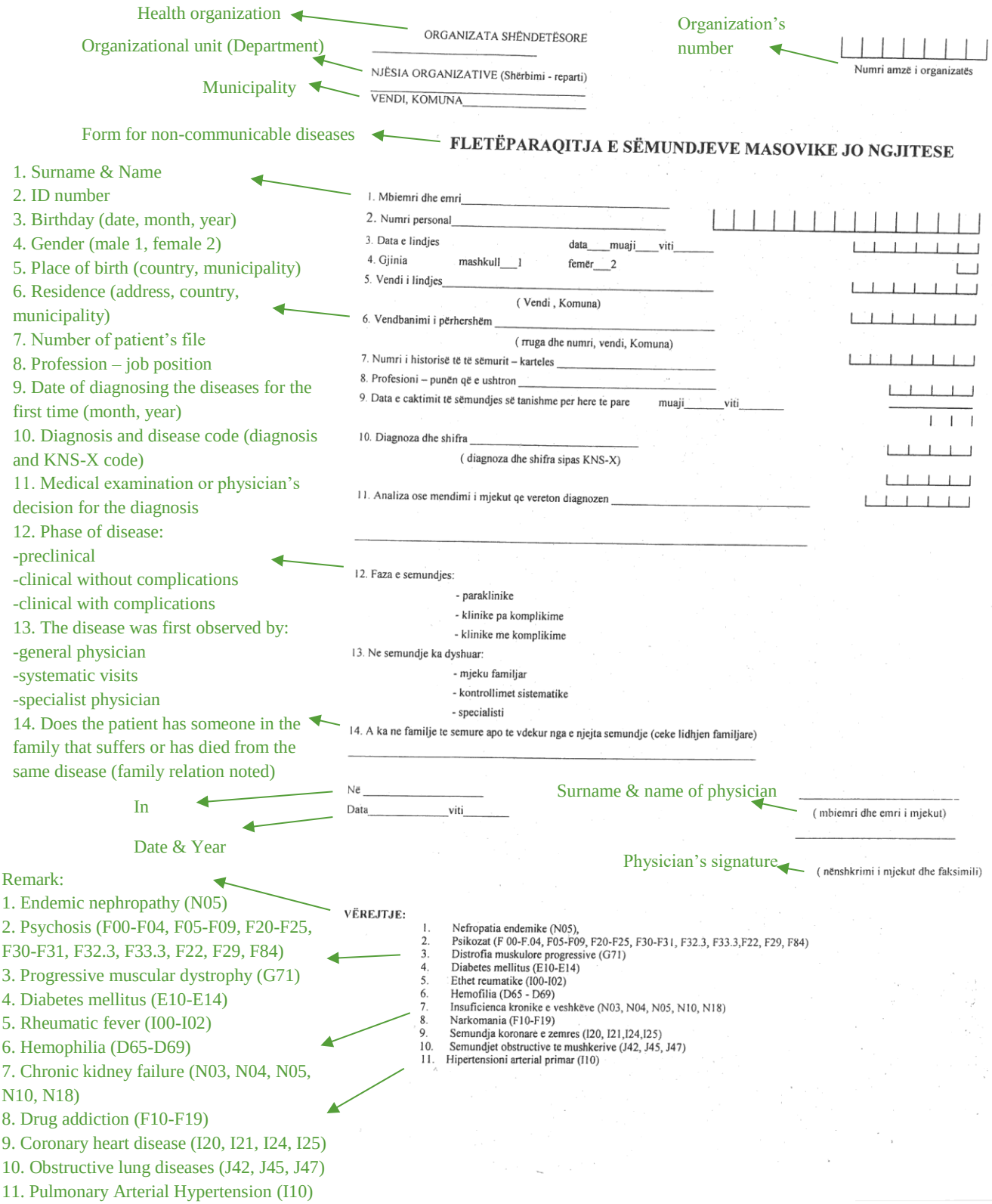
Appendix 38. Data available, labeling and arrangement regarding main activities of UCCK from a 2017 report in Albanian

Kinikat	Shtretër	Ditë shërimi	Numri i të shtrirëve	Numri i të operuarve	Vizita Diagnostike	Shërbime të veçanta	Shfrytëzimi i kapaciteteve
Klinika Obstetrike Gjinekologjike	396	90.073	18.003	5.846	58.273	106.492	62,3
Klinika e Dermatologjisë	36	8.650	849		9.513	536	65,8
Kirurgjia Abdominale	69	16.629	2.645	2.183	2.512	4.090	66
Klinika e Kirurgjisë Maksillofaciale	25	6.952	801	1.115	4.313	5.560	76,2
Klinika e Ortopedisë dhe Traumatologjisë	98	15.262	2.489	2.513	3.416	11.781	42,7
Klinika e Kirurgjisë Torakale	26	7.673	962	827	177	7.389	81
Klinika e Gastroenterologjisë	33	9.763	890	-	5.136	12.783	84,84
Klinika e Hematologjisë	31	7.051	597	-	4.749	8.579	66,67
Klinika e Neonatologjisë	180	40.053	11.078	-	3.773	-	60,34
Klinika Infektive	126	37.399	3.652	-	8.378	7.224	74,82
Klinika e Syve	49	13.477	3.001	3.186	3.392	7.712	65,3
Kirurgjia e Nefrologjisë	91	6.580	505	-	1.668	47.497	19,1

Appendix 39. Data on the level of $PM_{2.5}$ in different regions during different months in 2017 from an original report in Albanian

Stacioni monitorues	Muajt												Mesatarja .2017
	I	II	III	IV	V	VI	VII	VII	IX	X	XI	XII	
IHMK	64.7	30.8	18.5	8.2	2.97	2.8	*	*	*	23.9	44.1	37.9	26
Rilindje	66.2	39.2	25.8	13.8	1.7	2.2	16.5	*	*	23.4	40	36.7	26.55
Drenas	66.2	61.4	23	10	15.2	16.1	20.8	20	14.7	18.3	40.3	31.1	28.09
Mitrovicë	36	38.9	34.9	13.8	*	23.4	35.4	25.8	16.8	22.8	38.5	26.2	28.40
Pejë	*	*	*	*	*	*	*	18.1	19.7	14.5	28.6	15.2	19.22
Prizren	*	*	*	8	7.4	6.48	5	4.4	10.2	*	*	*	6.91
Hani i Elezit	*	*	*	3.08	*	12.3	12.7	*	*	14.2	28.1	36.6	17.83
Gjilan	*	*	*	*	*	19.2	*	*	12.6	*	11.8	51.1	23.67
Palaj	*	*	*	*	*	*	*	*	14.7	24.1	35.1	17.5	22.85
Obiliq	78.5	51.1	40.3	40.5	11.6	*	38.9	43.2	31.2	*	55.5	52.9	44.37
Dardhishte	88.9	52	20	18.9	*	*	13.1	21.4	15.6	26.3	40.6	53.5	35.03

Appendix 40. Form required to be filled by physicians for patients suffering from non-communicable diseases (original in Albanian and with author's translation in English)



Appendix 41. Form required to be filled by physicians for patients suffering from malign diseases (original in Albanian and with author's translation in English)

Form for malign diseases

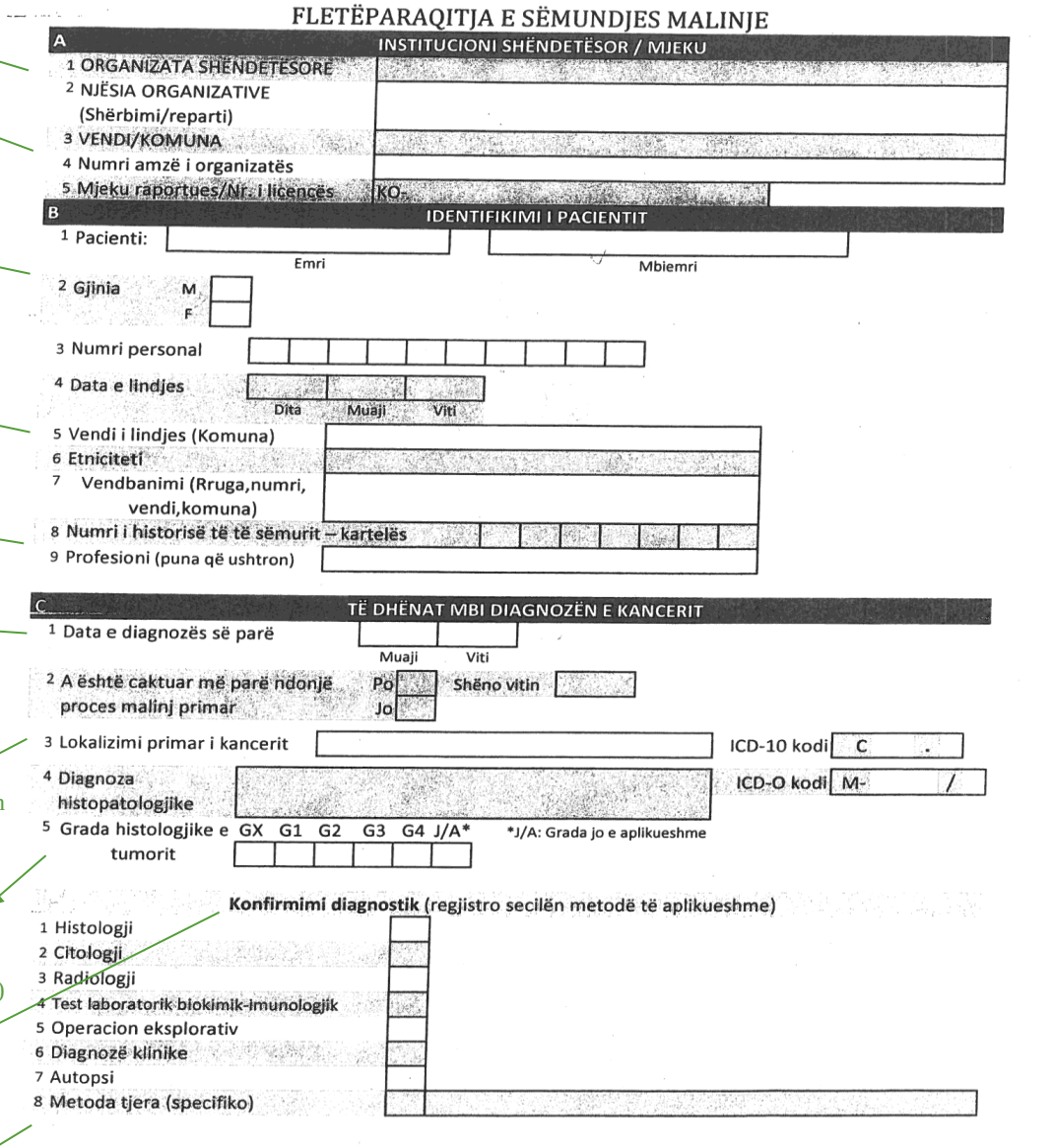
1. Health organization
2. Organizational unit (Department)
3. Municipality
4. Organization's number
5. Physician/ No. of license

1. Patient (Name & Surname)
2. Gender (M/F)
3. ID Number
4. Birthday (Day, Month, Year)
5. Place of birth (Municipality)
6. Ethnicity
7. Residence (Address, Country, Municipality)
8. Number of patient's file
9. Profession – job position

1. Date of first diagnosis (Month, Year)
2. Has the patient been diagnosed with any primary malign disease before? (Yes/No, Year)
3. Primary cancer localization – ICD-10 Code
4. Histopathological diagnosis – ICD-0 Code)
5. Histologic grade of the tumor (GX, G1, G2, G3, G4, J/A* (*-Grade not applicable)

Diagnostic confirmation (register each applicable method)

1. Histology
2. Cytology
3. Radiology
4. Biochemical-immunological laboratory examination
5. Exploratory surgery
6. Clinical diagnosis
7. Autopsy
8. Other methods (specify)



FLETËPARAQITJA E SËMUNDJES MALINJE

A INSTITUCIONI SHËNDETËSOR / MJEKU

1 ORGANIZATA SHËNDETËSORE
2 NJËSIA ORGANIZATIVE (Shërbimi/reparti)
3 VENDI/KOMUNA
4 Numri amzë i organizatës
5 Mjeku raportues/Nr. i licencës KO-

B IDENTIFIKIMI I PACIENTIT

1 Pacienti: Emri Mbiemri
2 Gjinia M F
3 Numri personal
4 Data e lindjes Dita Muaji Viti
5 Vendi i lindjes (Komuna)
6 Etniciteti
7 Vendbanimi (Rruga,numri, vendi,komuna)
8 Numri i historisë të të sëmurit – kartelës
9 Profesioni (puna që ushtron)

C TË DHËNAT MBI DIAGNOZËN E KANCERIT

1 Data e diagnozës së parë Muaji Viti
2 A është caktuar më parë ndonjë proces malinj primar Po Jo Shëno vitin
3 Lokalizimi primar i kancerit ICD-10 kodi C .
4 Diagnoza histopatologjike ICD-O kodi M- /
5 Grada histologjike e tumorit GX G1 G2 G3 G4 J/A* *J/A: Grada jo e aplikueshme

Konfirmimi diagnostik (regjistro secilën metodë të aplikueshme)

1 Histologji
2 Citologji
3 Radiologji
4 Test laboratorik biokimik-imunologjik
5 Operacion eksplorativ
6 Diagnozë klinike
7 Autopsi
8 Metoda tjera (specifiko)