

# Foreign citizen mortality in Split-Dalmatia County during the period 2001-2015

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**Master's thesis / Diplomski rad**

**2017**

*Degree Grantor / Ustanova koja je dodijelila akademski / stručni stupanj:* **University of Split, School of Medicine / Sveučilište u Splitu, Medicinski fakultet**

*Permanent link / Trajna poveznica:* <https://urn.nsk.hr/urn:nbn:hr:171:408462>

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*Download date / Datum preuzimanja:* **2024-04-25**



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UNIVERSITY OF SPLIT



**UNIVERSITY OF SPLIT  
SCHOOL OF MEDICINE**

**Inger Lise Saltvig**

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SPLIT-DALMATIA COUNTY  
DURING THE PERIOD 2001-2015**

**Diploma thesis**

**Academic year: 2016/2017**

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**prof. Marija Definis-Gojanović, MD, PhD**

**Split, June 29<sup>th</sup> 2017**

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## **2. ACKNOWLEDGMENTS**

*The work with this thesis as well as my education at the School of Medicine in Split has been a journey, both demanding and rewarding. Before I started, it was hard to imagine what the result would be. It has almost been like an exploration through the world, following the uncharted path of my life.*

*I owe a great thank to my mentor prof. Marija Definis-Gojanović, that let me write my thesis in the Department of Forensic Medicine and also gave me invaluable comments and support. I also owe a special thanks to my co mentor Kristijan Bečić. He helped me collecting data from CBC, helped me with technical problems and gave me invaluable comments and support. He also interpreted some very typical doctor handwriting that was unreadable to me from the Book of the Dead (not the Egyptian one). His kind help has meant a lot to me.*

*I would also like to thank my family for encouraging me to start studying medicine. My husband Gisle for supporting me in all ways, my daughter Iselin for “pushing” me to do this, and commenting on my thesis, my son Erlend for his support, as well as my daughter in law, Eva, and son in law, Zvonko. I love You all and I look forward to meeting some new family members in September and November.*

### **3. INTRODUCTION**



*“... to explore strange new worlds, to seek out new life and new civilizations, to boldly go where no one has gone before...”*

*Star trek, 1989*

Since the dawn of man, our species has travelled. Our ancestors moved from their cradle somewhere in Africa (1,2) and inhabited new territories. Findings suggest that all humans originate from only few individuals – the theory of seven Eve’s daughters. Fossil and genetic evidence supports a single, recent (less than 200,000 year) origin of modern Homo sapiens in Africa, followed by later population divergence and dispersal throughout the world (the “Out of Africa” model) (1). It also shows that this travel out of Africa occurred several times. It might have been out of necessity, or it might have been curiosity that led mankind to spread all over the globe. And we are still travelling, more than ever, and in a much larger scale. We do it for pleasure, business, education, hope of survival or a better life. While travelling was a time consuming and quite risky affair just a century ago, it is considered far safer today, but as this study will show, not completely riskless.

### **3.1. HISTORY OF TOURISM**

In the era of the Egyptian kingdom (3) the wealthy travelled to see famous historical places, like the pyramids or the Great Sphinx at Giza, that were already thousands of years old, or to attend festivals. In Greece, they facilitated traveling by accepting foreign currencies, and even providing accommodation (3,4). They would travel to worship and seek guidance in Delphi, or to participate in sport games. People travelled also for exploration. Herodotus, known as the father of history, travelled great distances after he was exiled from Halicarnassus. Among places he claimed to have visited were Ukraine, Sicily, Babylon (5) and he even travelled as far south as the first cataract of the Nile. It is commonly accepted by historians that he probably did not himself see all the things he described (6). Alexander the Great, the warrior king of the ancient Greek Kingdom of Macedonia, conquered his way to Egypt, founding the city of Alexandria, and he fought victorious battles as far as to the Indus river (7). He died in Babylon in the year 323 BC, in the city he planned to use as his new

capital. We might wonder if it was the drive for expansion of his territories, out of need for more areas, honor and glory or simply curiosity.

The Roman Empire was the post-Roman Republic period of the ancient Roman civilization, characterized by government lead by emperors and large territories around the Mediterranean Sea in Europe, Africa and Asia (8). The city of Rome was the largest city in the world ca 100 BC – ca AD 400, with Constantinople (New Rome) becoming the largest around AD 500 (8).

As the Roman empire rose, a wide net of roads was built. The vast empire needed good roads to transport soldiers and goods. With these excellent roads, it was simpler to travel. People from Rome went to the beaches of Greece, Egypt or Italy during the scorching summers. Thermal baths that had been used for medical purposes soon became popular attraction for the upper social class (3). Later, when the Roman empire collapsed, the maintenance of the roads faltered, but they did not go out of use and can still be seen in the landscapes of Europe today.

### **3.1.1. Diocletian**

Gaius Aurelius Valerius Diocletianus was born in Salona in Dalmatia in 240 AD. Diocletian advanced from soldier until he in the age of 44 was elected emperor. He governed from the eastern part of the Roman empires capital: Nicomedia. During his young years he forbase Christianity and even persecuted the Christians. When older, he himself got christened (9).

Diocletian never forgot Salona, his birthplace, and the neighboring fisher village Aspalathos, now Split. He had traveled a lot and seen many wonderful places, still he chose Split for a place to retract when he got old. Here, he built his own palace, meant to be his home when he retired. The building started in 295, and Diocletian moved in when he retired in the year 305 AD. Here he rested and grew vegetables for 11 years before he died (9).

### **3.1.2. Vikings**

The Vikings used their ships to travel far and wide (10). We do not fully understand why they started these travels, originally it might have been out of need for supplies, or wish

to gain new land, but also out of the wish to gain wealth and fame. Some think that curiosity was in great deal the cause for these travels. The history claims that Vikings were even the first to discover America, after the natives of course (11). We know for sure that they inhabited Iceland and later Greenland. They were ruthless as they moved through Europe. During these trips, they learned new things about the world, met new technologies, saw wondrous buildings, met Christianity and also brought some of the new knowledge back home.

### **3.1.3. Medieval Time**

Christianity spread throughout the world and this also led to a new form of tourism, the pilgrimage. Rich people wanted to see the famous churches and places they had heard about, and some even risked travel as far as the Holy Land.

People still travelled in the medieval time for business, education, or leisure. The crusaders, merchants, messengers, and people on pilgrimage found their way through Europe to the Holy Land, or other destinations. Students searched for education and travelled to enroll at universities in Paris, Oxford, or Bologna (12). The security provided during the Roman empire did not exist anymore, and the excellent roads had degraded. Along with the decreased political stability, robbers and beggars flourished along the roads. Large parts of Europe were in chaos due to wars and the consequences of the plague. The plague spread along the trading routs, and foreigners and sailors were met with skepticism. The first quarantine was established in Dubrovnik in 1377 (13). Travel was considered dangerous, and most people did not travel more than needed.

### **3.1.4. The Renaissance**

In the shadow of the plague, people again began to flourish and new discoveries filled this area. Brave men risked their lives in exploring new routes to other worlds on land or on the sea. Marco Polo found his way to China and America was rediscovered by Christopher Columbus (14). Not only did Columbus, and other sailors risk sailing out of the edge of the known world, but travelling so far was hazardous in numerous ways. The ocean was merciless, with storms and the ships movement decided by the wind. No wind meant no motion and with limited fresh food and water supplies on the ships, that itself could threaten

the crew. Additionally, the reason for scurvy had not yet been discovered, and could strike the sailors very hard. Travelling by ship could last for weeks or even months and, without the knowledge of the necessity of vitamin C, the voyage could become devastating for the crew (some sources claim that the Vikings knew about scurvy and that certain vegetables and herbs could prevent it) (15).

Australia was discovered only centuries later and soon people started inhabiting these new foreign worlds on a large scale.

### **3.1.5. New age**

The travelling in the 18<sup>th</sup> and 19<sup>th</sup> century was still strenuous, time-consuming and carried great risks. The means of transport as well as the roads were often hazardous. With the invention of the steamships, the railway, cars, and later airplanes, the time spent on travel was shortened. And the risks connected with travel were markedly reduced. Still the roads were not at our days standards, and the vehicles not designed with those safety measures as today. Seatbelts were not introduced to cars before the 1950s and it took almost 30 years before it was obligatory to use them (16). In 1969 the first man walked on the moon (17). No place seemed unreachable. We have sent vehicles to Mars, and a probe that could be interpreted as a tourist guide, and has already left our solar system.

From the mid-19<sup>th</sup> century travel among common people became more regular, and by 1920s the commercial airplane travel was well established (18).

### **3.1.6. Tourism today**

During the decades, there has been a continuous growth within tourism and it has become one of the fastest growing economic sectors worldwide. In 2015 1.2 billion persons travelled around (19). New destinations and development are linked to modern tourism. These factors have contributed to tourism as a key driver for socio-economic progress.

Tourism has evolved to play an important role in international commerce. In many developing countries, it represents the main income source. This expansion of tourism relates to diversification and competition for tourists.

Both developed and developing countries benefit from this in various ways and sectors. Construction, agriculture and telecommunications have economic benefits of the increased tourism.

### **3.1.7. Croatia as a tourist destination**

In Croatia, the period from the second half of the 19th century to the First World War was marked by the introduction of steam ship routes on the Adriatic Sea and construction of railroads and roads. Hotels were opened, first in Opatija in 1844 and Kvarner 1884, later in Zagreb, Zadar, Crikvenica, Dubrovnik and Samobor, to mention some. In this period, the first tourist guide books were written. In 1892 organization of trips to some towns began, and coastal towns became centers of health tourism. At that time, tourist boards were also founded (20).

Tourism bloomed in the time between the two world wars. Around 1930 the yearly visit of tourists was about one million. Compulsory tourist taxes were introduced and exchange offices established. The first tourist reviews were produced and both domestic and international air routes established. After the Second world war, Croatia needed some time to rebuild infrastructure and heal, but again the tourism flourished. During Croatian Homeland War, in the early 1990's, the tourism practically died out. Many of the tourist facilities were used to shelter refugees from neighboring Bosnia and Herzegovina. After 1995 the tourists started to return, and tourist number are growing ever since.

With over 12 million tourist arrivals in 2016 and still increasing numbers in 2017 Croatia has indeed become a popular tourist destination (21). Although it is still behind some other major tourist destinations like France, Spain, Italy and Greece, Croatia has become one of the most popular Mediterranean countries. The share of tourism in the total GDP of Croatia was 18.1% in 2015, also reflecting the country's investment in auxiliary infrastructure (21). The coastal regions of Croatia especially benefit from that. The summer is the busiest time of the year for the tourist industry. With such large numbers of tourists arriving in relatively brief period and to a relatively small area, there is inevitable increase in morbidity and mortality due to influx of this specific population

### **3.2. CAUSES OF DEATH**

There are several different causes of natural deaths, some preventable, some not. Tourists sometimes are not even aware that they suffer from some condition. However sometimes they are aware but also travel because of a desire to explore and to see something new. Due to this, death can occur while traveling, but it might also happen in safety of their own home. That is why natural causes are most difficult to prevent.

Among natural causes for mortality, cardiac failure is the number one leading cause worldwide (22,23). A growing number of the population will suffer from hypertension and or some heart condition. Due to efficient medication, symptoms may be absent under normal circumstances. However, while traveling might not be harmful, certain conditions during travel, such as longer periods of inactivity, temperature changes, dehydration, increased activity or even carelessness with drug administration, can trigger/elicit previously well treated symptoms. Subsequently, a person with well treated complicated cardiac failure, might decompensate during trip.

#### **3.2.1. Death by natural causes**

##### **Hypertension and cardiovascular disease**

It is estimated that close to 970 million people worldwide have elevated blood pressure (hypertension) (24). Of that number 330 million patients with hypertension are in developed countries, while remaining 640 million people are in developing countries. The World Health Organization rates hypertension as the most common cause of premature death globally, and the problem is rising (24). It is estimated that in 2025 there will be 1,56 billion people with hypertension (23,24).

Hypertension increases the risk for coronary heart disease and is the leading risk factor for stroke. It increases the risk of hemorrhagic stroke and increases the risk for ischemic stroke. Elevated blood pressure in persons younger than 50 years is associated with increased cardiovascular risk. As people age, the systolic blood pressure becomes a more important predictor for the risk of cardiovascular disease.

Increasing blood pressure is a part of aging process, but a healthy diet, maintaining a healthy body mass index (BMI) and physical activity might reduce the risk for this to happen.

Shear stress of the blood vessels can cause atherosclerosis and lead to narrowing of the lumen of the blood vessels making them more prone to obstruction by blood clots. Small parts of its fatty material might break off from the endothelium of the vessel wall and obstruct the blood vessel. It can also cause stiffening of the vessel wall. Damage to the arteries might also lead to weak areas that rupture easily or areas that balloon out of the artery wall creating an aneurysm (22,23,25).

Atherosclerosis is caused by a complex process where fatty deposits can clog the arteries. These deposits are called plaque. They are composed of cholesterol, fatty material, cellular waste, calcium and fibrin. When the plaque builds up, the artery walls get thicker. The lumen of the vessel gets narrower and this reduces the blood flow and the oxygen delivery to the cells.

When this happens, various diseases may be the result, like coronary heart disease, angina, carotid artery disease, peripheral artery disease (PAD) and chronic kidney disease. Also, a part of the plaque can break off, and travel along the blood stream until it gets stuck in some part of the vessel. In narrowed vessels, a blood clot might form. For tourists sitting many hours on a plane this might present a risk. The stiffened and thickened vessels can also cause the heart to work harder, leading to different cardiopathies (23,25).

### **Infectious diseases**

In addition to the dangers directly related to the travel, travelers are at risk of encountering infectious diseases. In the new worlds, the travelers brought with them communicable diseases and got some in exchange (like syphilis). They also met diseases brought by insect vectors like mosquitos, ticks, sandflye or tsetse-fly, that spread malaria, dengue fever, yellow fever, Lyme disease Leishmaniasis and sleeping sickness (26). Serious diarrhea like typhoid fever or cholerae led to numerous deaths. The knowledge of hygiene was scarce and the treatments few.

Infectious diseases were widespread in all parts of Europe and the rest of the world, and the cures were rarely effective. Diseases like measles, mumps, smallpox, diphtheria, polio, pertussis, rubella, TBC, and various forms of hepatitis were (and still are) very dangerous diseases, and kept the number of child death toll high during previous centuries (26).

New discoveries in medicine brought the knowledge of the necessity of hygiene, and led to improved healthcare and reduced the risk of some of the infectious diseases. During the 20<sup>th</sup> century a wide range of vaccines were developed, which further reduced the number of infectious diseases. Vaccination prevent a great number of potentially deadly diseases, and vaccination programs all over the world have lowered their number. The knowledge of hygiene and health has further lowered the risk of getting serious ill from infectious diseases.

Today most of these diseases still exist, for example in many parts of the world it is recommended to vaccinate against Hepatitis A and B, also to enter some countries it is a prerequisite to vaccinate and show proof of vaccination against Yellow fever (27). Travelling to areas with malaria requires prophylaxis in the form of tablets (27).

Resistance and skepticism against vaccination among parents have led many to not vaccinating their children, and diseases that were almost eradicated, now started spreading again. Recently, the Norwegian health department recommended that parents planning to go abroad with children with no previous vaccine against measles, should vaccinate their kids before travelling to another country. The reason is emergence of a large measles outbreak in Romania, and some other European countries (28).

Despite precautions, approximately 50% of travelers encounter some disease during their journey, most often in the form of traveler's diarrhea (27,29). This is rarely serious for anyone, more unpleasant and annoying. For small children and elderly, dehydration might be the biggest problem.

Malaria existed in some areas of Croatia until 1964, and a traveler might have encountered it (30). Today it is eradicated in Croatia.

### **3.2.2. Death by violent causes**

#### **Traffic accidents among tourists**

Today's cars are safer than before, but also faster. The roads are better and usually well marked. However, travelling by car in a foreign country might lead to some misunderstandings due to traffic regulations, signs or habits. If the tourist is from UK, he/she is used to driving on the left side of the road, and when meeting intersecting roads, it might be instinctive to first check on right before driving on to a road. The same might count for the pedestrian from UK crossing a road, that he will first turn his head right, and then start to



walk. A study from Finland suggest that some signing rules might be dangerous (31). European signing policy favors uncontrolled intersections, a rule which contrasts with the U.S.A. policy. European drivers must always keep in mind the general rule of priority at cross-roads, which requires one to yield to a vehicle coming from the right, if not otherwise indicated. For a European driver, an uncontrolled junction means an obligation to yield to vehicles on the right while for U.S. drivers, adapted to the U.S.A. system with more frequent signing, an intersection unsigned from his direction suggests priority for him, particularly in an urban area. It is also easy to think that some tourists that are not familiar with highways or massive traffic, could potentially create dangerous situations. Highways usually have higher standard than smaller roads, and higher speed. Higher speed demands more attention from the driver. Neither should the driver be using his cellphone while driving or be under influence of alcohol. New scenery might take the concentration away from the traffic, or that one wants to reach some destination without taking time to rest, or neglecting the speed limits. Driving when tired increases the risk for accidents (32).

The use of cellphones while driving or driving after ingestion of alcohol is also diminishing the attention and reaction from the driver. Road traffic crashes cost most countries around 3% of their gross domestic product. Approximately half of those dying on the world's roads are vulnerable road users, like pedestrians, motorcyclist, or bikers (33). Obligatory use of seatbelts in all seats, and special safety measures for kids in the car might change the outcome of an accident.

## **Drowning accidents**

Travelling to a country like Croatia invites the tourists to take a dip into its clear blue water. The hot summer and the tempting Adriatic Sea stretching along the south-western coast makes the urge to swim almost irresistible. For many the possibility to enjoy long days along the beaches, playing, swimming or sunbathing is the main goal of their holiday. Swimming is considered healthy, but unfortunately sometimes people drown.

Drowning is an accident that could be prevented. According to WHO, drowning is the 3rd leading cause of unintentional injury death worldwide, accounting for 7% of all injury-related deaths (34). In 2015 there was an estimated 360 000 annual drowning deaths globally. Worldwide estimates may significantly underestimate the public health problem related to drowning. Children and males, and those with increased access to water are most at

risk of drowning. International Lifesaving Federation has made a statistic over who is most likely to drown (35).

Worldwide, most drownings occur to people in three age categories:

- 0 to 5 years old
- 20 to 25 years old
- over 60 years old

We must learn to swim. Small children usually do not learn this during the first 5 years of life, although baby swimming is a way to teach the baby to use an innate reflex that seals off the glottis, and the water entering the upper respiratory tract is diverted into the stomach when the head is submerged (36). After some months, the diving reflex will cease to exist if not trained (36). The baby swimming also promotes the babies to learn to keep their breaths, but they do not learn to swim. Even they might be able to hold their breath for some period, they might not be able to lift the head out of the water, or to maintain in a surface position. Most infants and children drowning occur in shallow water and when unattended.

The higher number of drowning is in young males, possibly due to the reckless behavior or overestimation of their own swimming abilities that causes drowning. Older people might have never learned how to swim, or they might have some preexisting pathological conditions.

When we enter the water and submerge, a lot of physiological changes happens. The cardiovascular-respiratory reaction is called the diving reflex. It is a complex reaction to immersion. The reaction consists of apnea, bradycardia, peripheral vasoconstriction, protecting the perfusion and delivery of oxygen to the brain and the heart. It also decreases the cardiac output with normal or increased stroke volume. There is also an increase in mean arterial blood pressure. These physiological reactions are doing so to conserve oxygen for the heart and brain. Bradycardia is the response to facial contact with cold water, the human heart rate slows down ten to twenty-five percent (37). A characteristic of the so called human diving response is cardiac arrhythmias. This is thought to potentially provoke lethal fibrillation for susceptible persons with preexisting health conditions. Even it is not lethal, the pain from angina and/or discomfort from palpitations might compromise the persons swimming abilities.

At the water temperature 25-29°C a person immersed in water will have an increased energy conversion, equal to an ergometer load of 75 kW even without any physical activity. It is enough to be in the water to elicit hemodynamic changes, such as changes in heart rate, stroke volume and cardiac output, and changes in systolic and diastolic pressure. These changes are a function of the water temperature, activity level, age and preexisting conditions of the cardiovascular system (38). Arrhythmias due to neural responses to face immersion in cold water might be accentuated in persons with preexisting cardiopathies.

Pain and cramps can make the swimming difficult and unforeseen things can happen in the water. Because of that, people should aim to swim at places with other people around (39).

## **Suicides**

In high income countries suicide accounts for approximately 17% (WHO 2013) of all deaths in the age group 15-29 years. That makes it the leading cause of deaths in this age group. Worldwide 8,5 % of deaths among young adults are found to be due to suicide (40).

WHO has made a report about how to prevent suicide, and sees it as a global matter to make strategies to prevent suicide (40). Suicide should be preventable and to reduce its incidence cooperation between media, non-health sectors and communities is needed. It should be actively sought to improve the early identification of persons at risk (41). This also implies early detection and effective management of mental disorders or substance-use disorders(40,41). According to WHO reduced access to the means for suicide, like firearms and certain drugs is effective (40,41). Yet, people use other methods like hanging or drowning.

Schools and communities play a critical role in prevention of suicide. Social support to persons at risk and follow-up care is important. Suicide contains a lot of stigma and is often silenced. It is important to fight stigma and be open about the problem (41,42).

For people that have survived an a to suicide attempt, follow-up care is important. Those that have attempted to commit suicide are at greatest risk for trying again (41,42).

Responsible reporting of suicide in the media is also important. The media should avoid making it a sensation, and avoid description about the method used. Yet, we have internet and social media and it is hard to avoid groups talking about it. For example, when a

Google search is performed with “how to commit suicide” on date July 28<sup>th</sup> 2017 approximately 11 300 000 results were offered (43). Unfortunately, this shows how easily accessible this information is to young and depressed and how hard suicide can be to prevent.

It might be difficult for health personnel, community, friends and family to identify persons at risk, but WHO states that care and support are important in prevention of suicide (40).

## **Homicide**

WHO, police and governments work for prevention of violence and focuses on interpersonal relationship like child maltreatment, youth violence, sexual violence and elder abuse. Around 470 000 homicides occur worldwide annually, and millions suffer from violence related injuries. In addition to death and injury, alcohol and drug abuse increase the risk of violence and vice-versa. It is a vicious circle. Victims of violence are also suffering from anxiety disorders, suicidality, chronic diseases like cardiac diseases, diabetes and cancer among many other conditions. They are more likely to have social problems and be involved in crime and violence. WHO suggest a four-step health approach to that includes defining the problem, identifying causes and risk factors, designing and testing interventions, and increasing the scale of effective interventions (44,45).

Many factors influence the process that leads to homicide, among them availability of a weapon (46). Firearms with their high level of lethality are the most used weapons, and are used in four out of every ten homicides worldwide. Various psychoactive substances can act as “enablers”. The use of illicit drugs or consumption of alcohol increases the risk for someone to become perpetrator or victim of violence (44,45,47). Violence is often associated with the drug market and competition about areas. Homicides are not limited to drug-related or criminal activities. It is also committed among partners, and people with some existing relationship. Children are victims of violent crime and homicide following child abuse. Sometimes the homicide is the result of a robbery, or to hide a crime. A foreign citizen should be careful when entering a foreign country, not make it tempting to rob him/her, like counting money in front of the ATM and being careful when making new friends, as well as avoid dark lonely places during the night.

Prevention of violence and homicide is depending on politics and weapon laws, as well as that the society follows the regulations stated by the law. Croatia have a low homicide rate with 0,87 per 100 000 (48). It also has strict regulations for weapons (49).

#### **4. OBJECTIVES**

The aim of this study is to investigate the mortality rate and causes of deaths among foreign citizen visiting Croatia. With increasing number of visitors and also the economic contribution to GDP, it seems important to assess the safety of the tourists.

## **5. MATERIALS AND METHODS**

Data were collected from the Department of Forensic Medicine, University of Split – School of Medicine and University Hospital Centre Split, which is the autopsy center of the county with approximately 20% of visitors from foreign countries. The data was obtained from autopsy records and contained information about sex, age, citizen ship, and the cause and type of death.

Data about tourist arrivals, GDP and differentiation by nationality were retrieved from the Croatian Central Bureau for Statistic (Statistical yearbook) for the period 2001-2015 (21).

The mortality rate (number of deaths per nationality per 100 000 entrances) and standardized mortality ratio (SMR; ratio between the observed and expected number of deaths) were calculated. Mortality rate and general statistics for nationalities were calculated for the entire 15-year period but SMR was calculated only for period 2005-2015 since data for tourist entries in the county per nationality is only available for that period. National mortality rates from WHO database (50) were used for mortality ratio comparisons and standardized mortality ratio calculations. As WHO data on mortality were annual death rates and average time of foreign citizens' stay in Croatia was 5.6 days, overall mortality rates were adjusted to a 5.6-day period. We assumed that the mortality rates in reference population were constant throughout the year.

Citizens from Bosnia-Herzegovina and Serbia were excluded from this research because they often have double citizenship, and it is impossible to find out who that might count for.



## **6. RESULTS**

Among foreign citizen there were 284 deaths (210 men, 73.9%) in the period 2001-2015 with 209 deaths in period 2005-2015 which gives a mortality rate of 0.0012%. Average age at death was 54.89 years. Natural causes accounted for a total of 143 deaths, mostly among older people. Total of 137 deaths (48.2 %) were caused by injuries, and here it was most often among younger people. These injuries were most often caused by drowning or related to traffic (26.7 % and 8 % of all deaths respectively). Citizens from Germany, Czech Republic, Austria and Poland were most often represented, with 53 (18.6%), 52 (18.3%), 27 (9.5%), and 27 (9.5%) deaths respectively. Mortality rate by nationality showed no significant difference ( $P < 0.05$ ). Numbers of deaths per cause of death is shown in Figure 1.

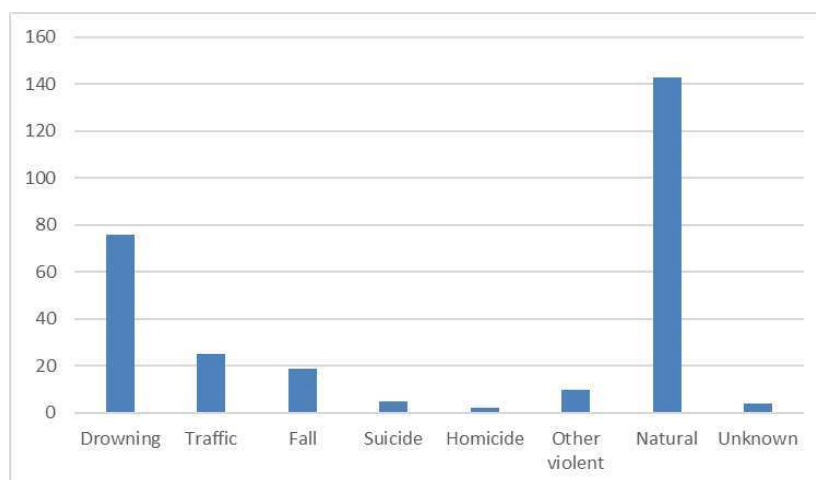


Figure 1. Numbers of deaths per cause of death

The number of foreign citizens who entered the analyzed region increased from 1,299,648 in 2005 to 2,256,002 in 2015. Average age by groups and types of death is shown in Figure 2.

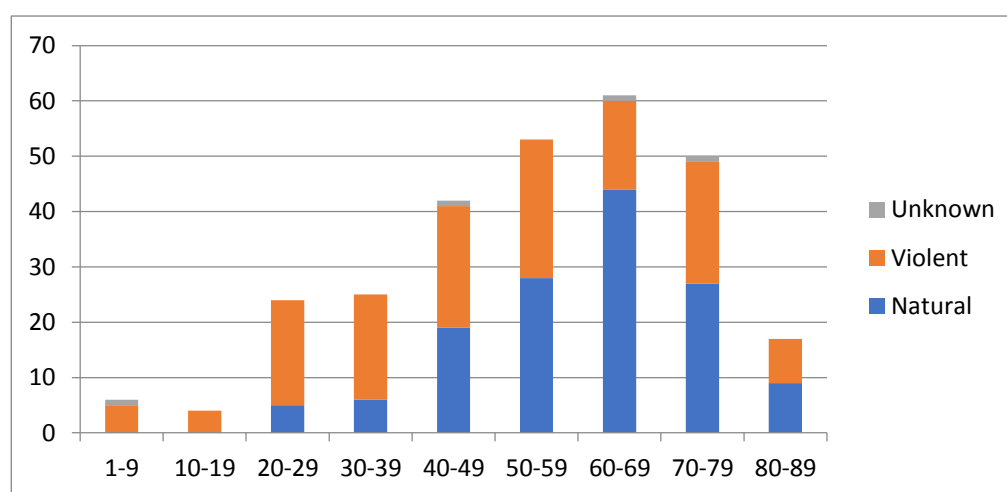


Figure 2. Average age by groups and types of death

Largest number of deaths occurred in age group 60-69, as well as from natural causes, but violent deaths were most often in age group 50-59 (total of 25 deaths). Also, the majority of violent deaths occurred in age group 20-59 (total of 85).

Nearly two third of the deceased were from four countries (Table1) - Germany, Austria, Czech Republic and Poland (total of 159; 55.99% respectively).

Table 1. Causes of death by nationality

Nationality	Natural	Violent						Total violent	Unknown	Total
		Drowning	Traffic	Fall	Suicide	Homicide	Other			
Germany	28	19	3	2				24	1	53
Austria	15	5	4		1		1	11	1	27
Czech Republic	22	19	5	2	1		1	28	2	52
Italy	8	2	1	3	1		1	8		16
Hungary	3	3						3		6
Poland	14	5	3	3			2	13		27
France	9	5	1				1	7		16
UK	7	3	1	2	1			7		14
USA	3	1	2	3				6		9
Other	34	14	5	4	1	2	4	30		64
<b>Total</b>	<b>143</b>	<b>76</b>	<b>25</b>	<b>19</b>	<b>5</b>	<b>2</b>	<b>10</b>	<b>137</b>	<b>4</b>	<b>284</b>

For each nationality a standardized mortality ratio and mortality rates were calculated. This number shows the ratio between number of observed and expected deaths. Among the Hungarian citizens mortality rate and the standardized mortality rate was lowest (SMR 0.06, MR 0.58) and highest in Austrian citizens (SMR 0.38, MR 2.3).

Table 2. Standardized mortality rates of foreign citizens by country in the period 2005-2015

	Mortality rate	No. of entrances	Number of deaths	Exp. no. of deaths	SMR	Mortality rate in this sample
Croatia	8.73					
Germany	6.31	1901542	33	119.99	0.275023	1.74
Austria	6.01	781479	18	46.97	0.383223	2.3
Czech	7.95	2266776	34	180.21	0.188669	1.5
Italy	5.34	976542	11	52.15	0.21093	1.13
Hungary	10.03	695467	4	69.76	0.057339	0.58
Poland	8.99	1657759	21	149.03	0.140911	1.27
France	5.66	960312	16	54.35	0.294388	1.67
UK	6.43	736833	11	47.38	0.232165	1.49
USA	7.46	466020	7	34.77	0.201323	1.5

## **7. DISCUSSION**

When compared with previous research about foreign citizen mortality, we find that Croatia still has a low foreign citizen mortality rate and can be considered a safe country for tourists, students and business. The term “foreign citizen” is used in this article as it is impossible to distinguish tourist from others that came for business related activities.

From 2001-2015 the number of tourists from foreign countries rose from 5,823,000 in 2001 to 12,683,179 in 2015, three times the Croatian population. And in the Split-Dalmatia county it nearly doubled from 1,299,648 in 2005 to 2,256,002 in 2015.

In this 11-year period, the number of entries into Croatia was 109,843,528 of which 17,838,659 (16,24%) entered Split-Dalmatia county. In 2015, 18.1% of GDB originated from tourism (51). It is important to assess the safety and health for those making this growth of GDP possible, namely the foreign citizens.

The most common cause of death among foreign citizens was ischemic heart disease (44.37%) confirming previous studies (52,53). Prevention of death by natural causes such as ischemic heart disease must start early and in the foreign citizens countries. This can be done by worldwide health campaigns. Today it is more focus on a healthy lifestyle, which might prevent serious heart conditions in the future, but still it is a global problem (22). Such deaths as those caused by ischemic heart diseases are poor markers of travelers’ safety.

Croatia cannot provide or be responsible for preventive measures of foreign citizens health, but they can provide adequate treatment. The Croatian Emergency Medical Services can offer treatment of high quality after its reorganization in the period 2006-2011(54). Today there are emergency medicine specialization for physicians and additional specialized training for nurses/technicians. There are also integrated emergency admission areas in hospitals, and telemedicine. Guidelines and algorithms for treatment are following international standards (54). Travelers with a chronic or underlying disease should always consider a pre-travel consultation before going abroad (26,27).

All violent deaths, including suicide and homicide should be considered preventable. But as we know, suicide is very often difficult to discover in time to prevent death even within a country’s own population. However, there were only 5 (1.76% of all deaths) suicides among foreign citizens in this county in the analyzed period, which is significantly lower than the rate of suicides in general population (half of the all violent deaths in the world) (WHO). This is not unusual as most visitors don’t come to a foreign country just to commit suicide.

Most of the injury deaths were unintentional deaths. The drowning mortality rate was 0.29 per 100 000 foreign citizens (27.46% of all deaths). This is not high compared to data from Australia, where drowning while surfing is 2.6 per 100 000 (25% of all drowning deaths) (55). Several studies show that drowning is the second most common cause of death among foreign citizens (56,57).

Most of the drownings happens close to the shore, thus it is important to have life guards on major beaches. It seems like a difficult task to inform all foreign citizens about possible dangers related to activities on or in the water but may be possible. If drowning was officially seen upon as a global matter, campaign for safer encounter with water could be preventive. Simple advices as to listen to the locals, appreciate warning flags on the beaches, or obey that no one should never bath or swim alone, could potentially prevent some fatal outcomes from drowning. Laws regulating activities on or in the water also could contribute, like more rigorous laws about deep water diving and maybe regulations of the use of waterjets or motorized boats. This could possibly prevent participation of inexperienced people in these activities.

The mortality rate in the traffic among foreign citizens was 0.07 per 100 000 (8.8% of all deaths) which is extremely low when compared to traffic mortality of Croatian citizens with 9.2 deaths per 100 000 in 2015 (50). Other countries have higher number of fatal traffic accidents leading to deaths among foreign citizens visit, with 37% in USA and 14% in Australia (56). This also disputes the theory by Sumala (31) and Petridou et al (57) that foreign citizens are at larger risk of traffic accidents than domestic drivers. It is possible to reduce the number of traffic accident through different actions. One of these is the focus on safer roads and the building of highways, redesigning dangerous intersections and roads in bad conditions, more strict laws about alcohol limits (0.5% at the point), and getting drunk drivers off the road.

In the studied period, it was found that homicide death rate was 0.7%. When we compare with the crude death rate of Croatian citizens which is 1.14 per 100 000, it appears that foreign citizens are in less danger to be murdered than Croatian citizens. As with suicide, homicide can be found hard to prevent because of its often-hidden nature of the action. Homicide often is an action with no witnesses. It is also hard to tell who will commit the illegal action. Some preventive measures can be taken, like lights in dark streets, visible police in the streets, and strict weapon regulation, which Croatia already has (49).

Compared to some other countries like Australia, the injury death rate was 0.55 per 100 000, which is nearly 4 times lower than Australian estimate (2.01 per 100 000).

Some nationalities are represented in greater number than other foreign citizens, and some nationalities might seem more at risk. Because of this mortality rates for each nationality were calculated. Standardized mortality rates mortality ratios for all nationalities were lower than expected. Demographic data of the travelling population is usually the same as the general population used for mortality rate calculations, therefore the calculations should be taken with caution. There has also been a problem adjusting the mortality rates because most of the foreign citizens arrive in analyzed county in summer which increases the risk in one period of the year. Also it had to be taken into account that each nationality has different proportions of death home or abroad.

Unfortunately, there are not many studies with which these results could be compared due to the fact that most often countries analyze the mortality of their own citizens while abroad and not mortality of foreign citizens entering their own country (58,59).

Croatia has several times been chosen among the top tourist destinations in the world. Magazines like Lonely Planet, National Geographic Adventure and New York Times, have recommended Croatia numerous times due to its natural beauties, sights and culture as well as safety, which has also been confirmed with this research.

For tourists, it is important to know that the tap water is safe to drink, that hygiene has a high standard, that the health care is safe, and that there are few dangerous species (no one in our study had died due to any of afore mentioned issues)

Still people get ill when travelling; a study shows that nearly 50% of travelers will encounter illness, most often in the form of gastrointestinal problems such as travelers' diarrhea. This is normally not dangerous, but annoying and irritating (29).

Some foreign citizens suffer from more serious health conditions, most often of cardiovascular origin, and they are often unaware of them. In our study, cardiovascular diseases are the single most frequent cause of death among foreign citizens, whereas most of the unnatural deaths are found to be associated with traffic related deaths, and drowning

Croatia is considered a relatively safe country by some embassies, with low levels of crime (60,61,62). This study found nothing proving otherwise, and is in line with previous studies (52,53).

## **8. CONCLUSION**



Croatia is a safe traveling destination. Its injury death mortality rate is only 0.55 per 100 000 foreign citizens' entries, mostly due to drowning and traffic-related deaths. Although these deaths occur suddenly and unexpectedly, the number could be reduced even more if safety information about the dangers of the open sea was prepared and more strict traffic, diving, and sailing regulations were introduced.

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## **10. SUMMARY**



## **Objectives**

To investigate the mortality rate of foreign citizens in Croatia.

## **Materials and methods**

Data were collected from the Department of Forensic Medicine, University of Split – School of Medicine and University Hospital Centre Split (which is the autopsy center of the Split-Dalmatia County with approximately 20% of total foreign visitors), as well as from the Croatian Central Bureau for Statistics for the period 2001-2015. The mortality rate (number of deaths of members of each nationality per 100 000 entrances ratio) and standardized mortality ratio (ratio between the observed and expected number of deaths) were calculated for period 2005-2015.

## **Results**

There were 284 deaths (210 men, 73.9%) of foreign citizens (mortality rate of 0.0012%). A total of 143 deaths (51.8%) were by natural causes, more often among older people, and 137 deaths (48.2%) were injury deaths, more often among younger people, mostly by drowning or traffic-related (26.7% and 8% of all deaths, respectively). Most represented were citizens of German, Czech, Austrian and Polish nationality, with 53 (18.6%), 52 (18.3%), 27 (9.5%), and 27 deaths (9.5%), respectively. Mortality rate by nationality showed no significant difference ( $P < 0.05$ ). The standardized mortality ratio was lowest in Hungarian citizens (0.06) and highest in Austrian citizens (0.38).

## **Conclusions**

Croatia has low foreign citizens' mortality rate and could be considered a safe tourist destination.

## **11. SAŽETAK**

## **Ciljevi**

Istražiti smrtnost stranih državljana u Republici Hrvatskoj.

## **Materijali i metode**

Podaci su prikupljeni na Kliničkom odjelu za sudsku medicinu, Sveučilište u Splitu – Medicinski fakultet i Klinički bolnički centar Split (koji je obdukcijski centar Splitsko-Dalmatinske županije u koju dolazi približno 20% svih stranih državljana koji posjete Hrvatsku), kao i s Državnog zavoda za statistiku za razdoblje 2001-2015. Stopa smrtnosti (omjer broja umrlih za svaku nacionalnost na 100 000 ulazaka) i standardizirana stopa smrtnosti (omjer smrtnih slučajeva i broja očekivanih smrtnih slučajeva po nacionalnosti) je izračunat za razdoblje 2005-2015.

## **Resultati**

U navedenom razdoblju ukupno je bilo 284 smrtna slučaja (210 muškaraca, 73.9%) stranih državljana (stopa smrtnosti 0.0012%). Ukupno 143 smrti (51.8%) su bile prirodne i češće su se događale među starijim turistima, dok je 137 smrti (48.2%) bilo nasilno, češće među mladima, najčešće uslijed utapanja ili povezano s prometom (26.7% i 8% svih smrti). Najzastupljeniji su bili građani Njemačke, Češke, Austrije i Poljske sa 53 (18.6%), 52 (18.3%), 27 (9.5%), i 27 smrti (9.5%). Stopa smrtnosti među nacionalnostima nije pokazala statističku značajnost ( $P < 0.05$ ). Standardizirana stopa smrtnosti je bila najniža u Mađarskih (0.06), a najviša u Austrijskih građana (0.38).

## **Zaključci**

Hrvatska ima nisku stopu smrtnosti stranih državljana i samim time može biti smatrana sigurnim turističkim odredištem.

## **12. CURRICULUM VITAE**

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<b>Dates</b>	
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1992 – 1994	Housewife
1994 – 1997	Part time working
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2012 – 2017	School of Medicine, University of Split
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Other skills and competences	Great at making pancakes
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