

The Prevention of Road Accidents in the Countries of Europe, Asia and the United States of America

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Abstract: The paper analyzes objective and subjective reasons and conditions that cause commitment of road traffic accidents in the countries of Europe, Asia and the USA and works out effective measures for preventing road traffic accidents in those countries.

Key words: Road traffic accidents • Intoxication • Over speed • Traffic fatalities

INTRODUCTION

Annually 1,2 million people die in road accidents all over the world [1] [2] and another 50 million get injured. Road accidents cause death among young people aged between 10 and 24 according to the report of the UN news agency [1]. 90% of all fatalities fall on “poor” worlds. Generally, road traffic accidents cause damage in the amount of 518 billion U.S. dollars. This information was published by the World Health Organization (WHO) in the report titled “Youth and Road Safety” [2].

In the World Health Organization (WHO) European Region road traffic accidents carry away lives of about 350 people per day or over 127 thousand people per year which is comparable to a fall of a population of a middle-sized town. Another 2,3 million people annually get injured and physically handicapped [1, 2]. Even in the USA, residents of which famous for having passion for guns, the number of people shot to death on roads is estimated of about 10-12 people a year (which is significantly less than deaths caused by lightning stroke) [3, p.307]. In the USA in spite of the abundance of guns and low traffic fatality rate the probability of facing death in road accidents is twenty times higher than the chance of being shot [4]. Exhausted drivers cause about 12% of all road accidents. So one is to be more concerned about yawning drivers rather than those loading their guns [3, p.307].

Shall we estimate the number of people died in the USA as a result of terrorist attacks since maintaining

statistics collection (60's of the last century), then the result would not exceed more than 5000 people which is roughly the same number of people died from lightning [5, p. 42-46]. In particular every year in the USA on average 40000 people die in road traffic accidents. Every month more people have died on roads than from terrorist attacks of the 11th September 2001 [3, p. 305].

Most often deaths caused by road traffic accidents are registered in African states (20 or more death per 100 thousand population), less often in the Middle Eastern states (15-20 deaths). Most European, Northern and Southern American states as well as the former USSR countries form the third group (10-15 deaths per 100 thousand). The World Health Organization's “Youth and Road Safety” report draws attention to certain paradoxes. For instance, in industrially developed countries most of those killed in road accidents are car drivers. In the “poor” countries, on the contrary, the greatest number of deaths occurred among pedestrians, cyclists and public transport users [2]. In the USA more than half of those killed were drivers and passengers, whereas in Kenya this made only 10% of total number of disaster victims. In Delhi this number is even lower with only 5% of the total number of dead, while downed cyclists and pedestrians account for 80% [6].

However, the paradoxical facts are paradoxical only at first glance. I shall now try to explain them. The fact is that the traffic movement in Delhi is characterized by high intensity due to high population density. City area along with its suburbs accommodates

five times more people than the same area in New York [7], (which indeed looks overcrowded). The more people, the more motion, hence the more interaction. Another reason for chaos happening in Delhi lies in a huge amount of vehicles moving at different speeds and in different ways. In Delhi there are 48 types of transport with each struggling for survival. These 48 types of passage would bewilder any New York resident for in New York there are only five types of them: cars, trucks, bicycles, pedestrians and motorcycles or scooters (and a few runabouts and trishaws for tourists). In many cities of the USA there are only two of them, i.e. cars and trucks [3, p. 244, 238, 244].

Theoretically, there is nothing better than driving car on rural areas away from “crazy” urban traffic. Sometimes it is impossible to believe in cold statistics. On rural roads (excluding highways) the number of deaths is 2.5 times higher than for other types of roads (although there are far fewer vehicles). Turn on a rural road is 6 times more dangerous than on any other [8]. Most accidents occur with single cars heading off the highway. Therefore, by accidents they often blame bad roads layout, high speed, fatigue or drowsiness of the driver (or a combination of these factors). Moreover, usually in case of road accidents the emergency was too far [3, p. 289, 307, 289].

Literature Review: The causes of road accidents and the factors contributing to their growth are discussed in the works of the following authors: Vanderbilt [3], Muller [5], Mohan [6], Forstall [7], Joksch [9], Williams *et al.* [10], Kloeden *et al.* [11], Lewitt *et al.* [12], Compton *et al.* [13], Borkenstein *et al.* [14], Glasze *et al.* [15], Leong [16]. Research by Tyler [19], Small [22], Gates *et al.* [23], Retting *et al.* [24], Wood [25], Adebisi *et al.* [26] is dedicated to the studies of measures on road accidents reduction.

In the examined studies on traffic problems researchers have not identified periods of the year during which an increase in traffic accidents is registered.

The purpose of this study is to identify the main causes of road accidents in Europe, the United States of America, Asia and the Republic of Kazakhstan and to develop effective measures for its reduction by preventing their commission in the future.

It should be noted that the task of reducing road traffic accidents is not an example worse than even this frightening phenomenon of today's reality of terrorism.

MATERIALS AND METHODS

The methodological basis of the study determined the positions of dialectical method of scientific knowledge, as well as private-scientific methods: observation, comparison, scientific analysis, the method of expert estimates, systematic and structural, concrete sociological, comparative law and others. In order to achieve the objective results of the study these methods were applied comprehensively.

RESULTS AND DISCUSION

Speeding. In Kazakhstanspeeding as the main cause of road accidents occurs in 22 % of cases. Vanderbilt indicates that moving at a speed of above 30 km/h people lose the ability to maintain eye contact. The drivers traveling at a speed of above 30 km/h lose eye contact with a pedestrian and the likelihood of pedestrian's death in the event of an accident increases many times. Being creatures with evolutionary history, we seem to not have to move faster than the speed of our jogging (i.e. 30 km/h). This explains why the higher the speed of the machine, the greater the likelihood of fatalities in the event of an accident [3, p. 222]. In a collision at a speed of 80 km/h one has 15 times more likely to die in an accident than in a collision at a speed of 40 km/h (in this case a simple multiplication or division does not work) [9, p. 103-104]. Results vary linearly but exponentially, the risk increases much faster than the speed. Collision at a speed of 55 km/h on the third is more dangerous than a collision at a speed of 50 km/h [10, p. 227-232]. Study conducted in Australia showed that by average speed (and not limitation) of 60 km/h the risk of accident doubled when the speed is increased by only 5 km/h [11].

Bermuda people rarely die as a result of accidents. The speed limit on the island is 35 km/h. In the U.S. on Sanibel Island the speed limit is 55 km/h. This century there was not even a single fatal accident on the road despite the large number of cars and cyclists. As research in Australia showed, reducing the average speed of even a couple of miles per hour helps to reduce the risk of accidents [3, p. 308].

Intoxication. Economists Lewitt and Porter [12] believe that drunk drivers (from the view point of the law) who are onroad between 8 pm and 5 am are 13 times more likely to provoke an accident than the sober ones. Drivers with legally allowable alcohol level in blood become responsible for causing accidents seven times more

likely than the sober ones. Throughout the study among 11 thousands of deaths caused by drink-driving, 8 thousand made drunk motorists and their passengers and the remaining three thousand made other drivers (overwhelmingly sober) [12]. Other studies have shown that the risk of traffic accidents begins to grow even with small doses of alcohol in the driver's blood: at the level of BAC (blood alcohol concentration) of 0.02% the risk is low, then it starts to grow significantly at 0, 05% and reaches a peak in the range of from 0.08 to 0.1% [13]. A person whose blood alcohol content exceeds the permitted limit of 2.9 times risks getting into a serious car accident 20 times greater than the sober one [3, p. 293].

Another famous study done in the 60s of the last century in Grand-Rapids (the results formed the basis for legislation on allowable alcohol in many countries), showed that drivers with alcohol levels ranging from 0.01 to 0.04 % are less likely to get into an accident than those who do not drink alcohol [14]. This so-called "hollow Grand-Rapids" led many to the wrong conclusion that car drivers who drunk very little alcohol had a better understanding of the risks and therefore drove more carefully [3, p. 285].

Use of cell phones. The use of cellular phones while driving can cause a considerable risk to the transport safety. As American scientists' studies show, it is the phone dialing that puts the driver in a very dangerous position, while the conversation itself increases the risk of an accident only to a small extent [3, p. 96-97]. Danger of being involved in an accident as a result of cell phone use while driving lies in high visual distraction of the driver from the road at the time of manipulation of cellular phones. Use of headphones while talking on the phone in a moving vehicle largely reduces the risk of getting into an accident because of carelessness of the driver.

Cause of increased accidents, especially on highways with heavy traffic can become the so-called effect of "witness" at the expense of those who usually stop on both sides of the highway to look at the accident [3, p. 188] [4]. Drivers who stop to look at the accident themselves quite often get into accidents [15]. The presence of camera phones only worsens the situation for everyone wants to capture the accident [16].

China once again took first place in the world in the number of deaths that have occurred as a result of road accidents. The highest number of deaths in road accidents belongs to China since 1996. According to the Ministry of Public Security of China in 2012 on the

country roads there were 81,649 people killed. Almost eight thousand people more than the year before. For every 10,000 registered vehicles in the country there are five deaths per year. To compare, in the rest of the world this same figure is an average of two deaths per 10,000 vehicles [17]. Trying to explain the high level of deaths resulting from road traffic accidents in China Vanderbilt in a book devoted to the problem of traffic congestion shares the following observations: "China's situation is special. Cars and bikes go even if they have already turned red, pedestrians cross the road as if they want to commit suicide and the impression that the drivers do not mind to help them achieve this goal" [3, p. 247].

In Figure 1 statistics show that the number of traffic fatalities in Europe from 2001 to 2012 tend to decrease.

European Traffic Safety Council (ETSC) announced and congratulated the eight European countries with a reduction on their roads of fatal accidents by 50% (from 2001). Among these eight countries are Latvia, Estonia, Lithuania, Spain, Luxembourg, Sweden, France and Slovenia.

Three Baltic countries are ahead of all the others: Latvia and Estonia had reached a reduction of 61%, Lithuania 58%. Then follow Spain (55%), Luxembourg (54%), France (51%), Sweden (50%) and Slovenia (50%). In Portugal, Ireland, Germany, Great Britain, Italy, Slovakia and Belgium the number of fatal accidents has decreased by 43% [24]. Reduction of traffic accidents in the Baltic countries in my opinion explains the demographic problems: the ongoing flow of people from these countries in particular of the Russian speaking population. According to some unofficial sources within 10 years the population there has decreased by 10-15%.

In the following the paper will explore the measures that can help reduce accidents on the roads. These include the following measures:

Improving the System of Toll Roads and Fines for Traffic Violations: Tayler says people do not follow the laws because they are afraid of fines or feel as if it would be better for them, but because they think it is right so. To do this they need to feel that the legal authorities are law-abiding [18].

Public feels that everything is right and fair if the traffic police tags fines and does not take bribes [3, p. 266]. Tayler discovered that those who go to traffic court, not more concerned with the result (even when it comes to large fines), but justice [19].

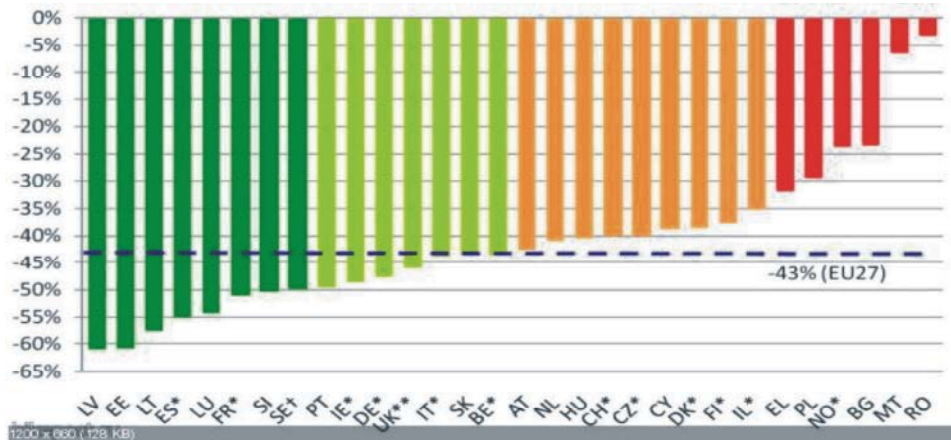


Fig. 1: Statistics fatal accidents reduction in Europe (since 2001)

Russia is considered to be more corrupt than the countries of the same level of development and this is reflected in its own ways: in Moscow at every corner there are corrupt policemen and the tube cars make their way through the traffic jam with fake flashing lights (which are sometimes installed illegally). Russia accounts for two-thirds of all fatal crashes in Europe [20]. Finland placed last in the world in the number of accidents [21] fines are calculated on a complex formula taking into account the driver's income after taxes. Prior to 1999 fines were calculated on the basis of income before tax. As a result, the amount of fines decreased by 20-60%, but was raised bottom level which led to an overall increase in the amounts of income from fines [3, p. 266, 402].

Many countries face the problem of highway traffic congestion. This problem is solved in the world in two ways: by giving drivers the traffic information and routing in real time and the introduction of fees for the use of loaded sections of road. The previous explains drivers how to avoid congestion on the road, the latter forcing them to avoid it. How much did the introduction of tolls affect drivers? According to the observations the total number of trips decreased by 13% [3, p. 201, 192]. Ride becomes expensive, so the traffic flow decreases. The money spent on public transport which will only benefit from the release of the roads. Buses are getting cheaper and thus become increasingly popular [22].

Roundabouts and crossroads: Drivers traveling on the roundabout occasionally slow down but they do not have to stop at traffic lights thus providing a smooth and relatively stable capacity on the road.

Cars approaching crossroads must let those who are already going through it. Moreover, they are very

effective. This is first and foremost due to their layout. Crossroads attract accidents: the half of all road accidents in the United States occurs on them. On a normal crossroad there are 56 potential "conflict" as engineers happen to call them spots where there is a risk of collision (32 of them where the car could crash into another car and 24 - where it can bring down a pedestrian).

Roundabouts reduce the total number of points to 16 and the presence of central islands excludes the two most dangerous maneuvers at the crossroads: its intersection itself often at high speed and a left turn [3, p. 144-148, 204-205]. It is found that the average speed on most roundabouts twice less than the average rate on a common crossroad [23]. Study which evaluated data on 24 roundabouts showed that the total number of accidents has decreased by 40 %, injury crashes by 76 % and fatal accidents by 90% [24, p. 628-631]. But there are other interesting facts. For example, the average time of crossing the roundabout decreased by 40 %, while the volume of traffic has increased. Bus waiting time decreased by more than twice. The researchers found that all the cars move in a constant stream and even at peak times it is quite stable albeit slow and any road engineer will confirm how important for drivers feeling of progress [3, p. 227].

Design of Curved Roads: According to authoritative experts in the field of road design long, straight roads represent a mortal danger because drivers simply fall asleep on them especially at night. That's why engineers design not straight but slightly curved roads, even if the terrain does not require this. Highway rule states that for the driver driving on a perfectly straight road should not exceed one minute. Unfortunately turns most of which

do not require special attention do not always cheer up a sleepy driver. So in the 80's of the 20th century shoulder rumble strip had been installed universally. The results were astonishing [3, p. 210]. Example on the highway in Pennsylvania amount of accidents related to the exit to the highway within the studied period decreased by 70% [25]. Curbs play a vital role in designing of curved roads. Vanderbilt in his book says: "The height of the curb is small, because the sidewalk is also the part of the plan. When you isolate people from each other by high curbs as if to say "this is my space and that is yours" drivers start to go faster. When you realize that at any time before your car can appear a child, you will slow down and go carefully"[3, p. 219].

Introduction of the Maximum Waiting Time at the Crossroads: In the organization of traffic there is an iron law: the longer pedestrians have to wait for the green signal, the sooner they begin to cross the street at a stoplight. The maximum amount of time that a pedestrian can withstand is about 30 seconds (which coincides with the time that drivers expect when turning left across traffic flow, before driving to the nearest gap between cars) [3, p. 254, 301]. According to some calculations after 30 seconds of patience drivers usually start to burst and they change their attitude to risk [26, p. 305-315].

Lowering the Minimum Speed Limit: These measures include both subjective and objective reasons that cause traffic accidents.

During 12 months of 2011 roads of Kazakhstan, according to units of territorial traffic police there were 12,019 road accidents registered. 87, 8% of all accidents were due to drivers [27] [28].

During 12 months of 2012 there were 14,168 road accidents recorded. In comparison with 2011 the number of incidents grew by 17.9%. There were 12,407 road accidents registered caused by drivers, accounting for 88% of all accidents [29].

During 12 months of 2013 there were 23,359 accidents registered, against 14 168 accidents reported in 2012 [30] (Figure 1).

Thus, in the past period there has been an increase in reported road accidents by 64.9 percent [30].

80% of accidents committed in 2011-2013 were caused by drivers [27-31]. According to Vanderbilt the cause of 90% of accidents is the "human factor" and not car breakdown, problems with the road surface and weather conditions [3, p. 90, 90-309]. This more than convincingly is confirmed by statistics.

The main causes of road accidents in the Ministry of Internal Affairs of the Republic of Kazakhstan are called speeding, leaving the opposite lane and driving while being intoxicated. Since the beginning of 2013 in Kazakhstan there were about 40 thousand drunk drivers detained [31].

Summarized statistics of the most common causes of road accidents in the Russian Federation appears in a similar way. Among the leading causes of traffic accidents: control of a motor vehicle while being intoxicated (25%), 17% of accidents on the roads occur as a result of exceeding of the established speed [32].

Moon and traffic accidents. In fact, hazardous are not only days of the full moon, but also 9th, 14th, 15th, 20th and 25-27th lunar days. According to statistics, it is on these days that number of accidents on the roads reaches its maximum. Not only drivers, but also pedestrians are to be mindful. The moon has no selective effect on only one category of the population e.g. drivers. Similarly pedestrians also become more fussy, inflated, nervous. As a result their attention suffers. By coincidence of the degree of inattention and irritability in road accidents usually both members of the incident suffer. In general, "bad" Moon raises the level of road traffic accidents by only 3%, but the full moon 12% and above. The least amount of traffic accidents were

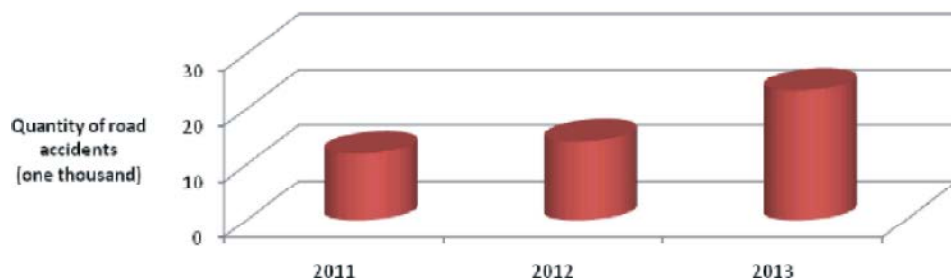


Fig. 1:

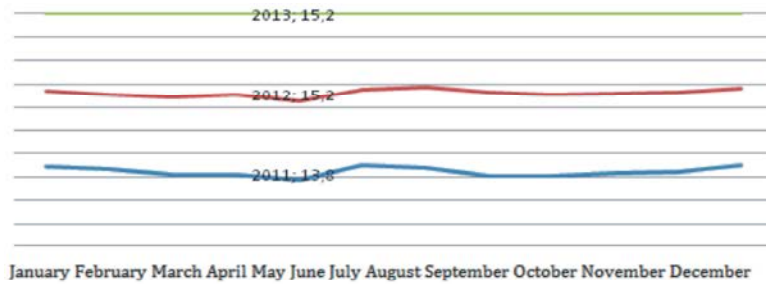


Fig. 2: Comparative dynamics of road accidents in the Republic of Kazakhstan for 2011-2013

recorded from 2 to 6 a.m. and the most from 4 to 11p.m. New and full moon phases are particularly strong during winter solstice in December and summer solstice in June and July [33].

Thereby in the period from September to December 2012 and from January to April 2013 the full moon was at the beginning of the month. In September and December 2011, from January to April 2012 and from January to May 2013 full moon raised in the middle of the months and from January to April 2011 at the end of the month, respectively. Prior to these time periods (lasting an average of 14 days) an increase of traffic accidents did not exceed 3%.

The growth trend in road accidents during these periods remained unchanged regardless of the year under review.

CONCLUSION

Thus, road traffic accidents in Europe, Asia, the United States are accompanied by a variety of contributing factors, such as the average age of drivers, the state of the economy, changes in law enforcement, insurance conditions, the weather, the number of different types of vehicles on the road, natural migration processes. The reduction of road accidents can be influenced by measures on system improvement of toll roads and fines for traffic violations, building roundabouts and crossroads, designing curved roads, the introduction of the maximum waiting time at the crossroads, adherence to speed limits. These measures include both subjective and objective reasons which cause road traffic accidents.

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