

# Impact of partial liberalization of driver's license regulations on the driving behavior of people with epilepsy: experience from Croatia

---

**Bielen, Ivan; Hajnšek, Sanja; Krmpotić, Pavao; Petelin, Željka; Šušak, Renata; Šepić-Grahovac, Dubravka; Sruk, Ana**

*Source / Izvornik:* **Epilepsy & Behavior, 2011, 21, 459 - 461**

**Journal article, Accepted version**

**Rad u časopisu, Završna verzija rukopisa prihvaćena za objavljivanje (postprint)**

<https://doi.org/10.1016/j.yebeh.2011.04.062>

*Permanent link / Trajna poveznica:* <https://um.nsk.hr/um:nbn:hr:105:518280>

*Rights / Prava:* [In copyright](#)/[Zaštićeno autorskim pravom.](#)

*Download date / Datum preuzimanja:* **2024-07-24**



*Repository / Repozitorij:*

[Dr Med - University of Zagreb School of Medicine](#)  
[Digital Repository](#)





## Središnja medicinska knjižnica

**Bielen I., Hajnšek S., Krmpotić P., Petelin Z., Šušak R., Šepić-Grahovac D., Sruk A. (2011) *Impact of partial liberalization of driver's license regulations on the driving behavior of people with epilepsy: experience from Croatia*. *Epilepsy & Behavior*, 21 (4). pp. 459-61. ISSN 1525-5050**

<http://www.elsevier.com/locate/issn/15255050>

<http://www.sciencedirect.com/science/journal/15255050>

<http://dx.doi.org/10.1016/j.yebeh.2011.04.062>

<http://medlib.mef.hr/1434>

University of Zagreb Medical School Repository

<http://medlib.mef.hr/>

# **IMPACT OF PARTIAL LIBERALIZATION OF DRIVER'S LICENCE REGULATIONS ON THE DRIVING BEHAVIOR OF PEOPLE WITH EPILEPSY – EXPERIENCE FROM CROATIA**

Ivan Bielen<sup>1</sup>, Sanja Hajnšek<sup>2</sup>, Pavao Krmpotić<sup>3</sup>, Željka Petelin<sup>2</sup>, Renata Šušak<sup>4</sup>,  
Dubravka Šepić-Grahovac<sup>5</sup>, Ana Sruk<sup>1</sup>

<sup>1</sup> Department of Neurology, University Hospital „Sveti Duh“, Sveti Duh 64, 10 000 Zagreb, Croatia

<sup>2</sup> Department of Neurology, Zagreb University Hospital Center, Referral Centre of the Ministry of Health and Social Welfare of the Republic of Croatia for Epilepsy, Kišpatičeva 12, 10 000 Zagreb, Croatia

<sup>3</sup> Department of Psychophysiology, Clinical Hospital Vrapče, Bolnička cesta 32, 10 090 Zagreb, Croatia

<sup>4</sup> Department of Neurology, University Hospital Center Osijek, J. Huttlera 4, 31 000 Osijek, Croatia

<sup>5</sup> Polyclinic for Neurology and Psychiatry "Interneuron", Krešimirova 22, 51000 Rijeka, Croatia

Corresponding author:  
Prof. Ivan Bielen, PhD, MD  
Head of the Department of Neurology  
University Hospital "Sveti Duh"  
Sveti Duh 64  
10 000 Zagreb  
Croatia  
Tel.: 385 1 3712 143  
Fax: 385 1 3712 372  
e-mail: [ibielen@kbsd.hr](mailto:ibielen@kbsd.hr)

**Abstract:** Until 2005 Croatia had a driving ban for people with epilepsy (PwE) taking antiepileptic therapy. To investigate the impact of partial liberalization of legislation the results of polling performed in 1999 and 2009 were compared. The results revealed that in 1999, despite driving ban, 46.9% of respondents had a driving licence, whereas in 2009 the majority of respondents with a driving licence (60.2%) fulfilled the requirement criterion of 2-years' remission. In both pollings 1/3 of respondents answered that they were driving less often than other drivers. The rate of PwE who were driving was inversely proportional to the seizure rate. In 2009 a greater proportion made statements that they drove motorcycles, and few PwE (<5%) declared they were driving more often than others. The inefficiency of rigid legislation and indicators of self-restraint of PwE may be arguments in favor of liberalization, but liberalization should be accompanied by appropriate education programs.

**Keywords:** epilepsy, driving, driving licence, regulations

**Introduction:** Quality of life in people with epilepsy (PwE) can be seriously disturbed with the inability of getting a driving licence [1-4]. It is believed, that inability to drive motor vehicles has negative influence on successful social interactions, employment and regularity of healthcare visits, with a consequent negative impact on treatment effectiveness. There is no doubt, however, that PwE who drive motor vehicles are at higher risk of causing or being involved in traffic accidents [5-7].

The driving licence legislation related to evaluation of driving capability of PwE varies markedly from country to country. According to a review article from 2000, a diagnosis of epilepsy excluded any possibility of obtaining a driver's licence in 16 out of the 96 countries examined [8]. In the interim, several countries have lifted these restraints, although the majority of patients worldwide are still prohibited from legally obtaining a driver's licence. In countries without a complete driving ban, the driver's licence may be issued if it is determined that epilepsy is satisfactorily controlled. In this assessment, the seizure-free interval is the main criterion. For example, in several countries of the European Union, a seizure-free interval of at least 12 months is required for non-professional drivers, but in some specific clinical situations, the required interval can be shorter [9]. American regulations are more lenient, with required seizure-free intervals of only 3-6 months in some states [10].

In Croatia, according to the regulation enacted in 1975 and still in force until 2005, non professional drivers and applicants for a driving licence were evaluated as incapable of driving in all forms of epilepsy and other disorders of consciousness, with the exception of medically controlled cases without therapy with at least a two-year seizure-free interval [11]. Since the antiepileptic therapy was considered a contraindication for driving, a driver's licence could not be issued for persons taking anticonvulsant medication even if in long-standing remission. Based on the initiative of the Croatian League Against Epilepsy and the Croatian Association For Epilepsy, these prohibitions were partially lifted in 2005. Antiepileptic therapy was no longer considered an unconditional contraindication for issuing a driver's licence, but a two-year seizure-free interval was still required [12]. The most recent regulations in Croatia were enacted at the beginning of January 2011; the required seizure-free interval has been shortened to 12 months and several details related to neurological evaluation of some clinical situations have also been included [13], but this regulatory change is not relevant to the present study because data was collected in 2009, two years before this new legislation was enacted.

Driver's licences in Croatia are issued after a medical examination that includes questions about epilepsy and other disturbances of consciousness. If a legal contraindication for a driver's licence is diagnosed or suspected in the subsequent period, physicians are legally obliged to report this to authorities. In this case, the authorities can revoke the driver's licence and the driver is obliged to seek medical re-evaluation. Mandatory reporting from physicians was maintained after the amendments of 2005. There is a pecuniary penalty for driving with an illegally obtained driver's licence, and such a licence is suspended.

The trend for liberalization, which is taking place worldwide, has significantly increased the number of PwE now able to drive legally. However, based on the information from the available literature, there are only a few studies that describe the changes in behaviour of PwE that could be interpreted as consequences of the liberalization of legislation. The aim of this study was to evaluate the possible impact of partial liberalization of driving licence regulations on some aspects of driving behavior of PwE in Croatia.

**Subjects and methods:** In 1999, a descriptive study exploring the legislation prohibiting PwE from driving was conducted in Croatia, and the results were published in *Neurologia Croatica* [14]. In 2009, about 5 years after the partial liberalization of driver's licence regulations, we conducted the same poll using the same questionnaire. Like the first survey in 1999, the polling was multicentric and organized around five epileptological services in Croatia. The questionnaire was offered to patients attending regular check-up consultations. Only patients aged 18-65 years with diagnosed epilepsy for at least two years were included. Those subjects with physical and/or mental co-morbidities incompatible with driving were excluded. The study and the questionnaire used were approved by the Ethics Committee, and the questionnaires were completed anonymously.

To obtain complete protection of privacy, the questionnaire did not contain any questions about age, sex, or most other personal characteristics. In this way the respondents could not be identified in any way, even by the researchers. This was important because the researchers, according to the current regulations, had the legal obligation to report every person with a driver's licence that was noncompliant with the regulations to the authorities. The polled subjects were asked if they had a driver's licence, whether they were driving, what type vehicle, and according to their impression,

how often they drove. The questionnaires from 1999 and 2009 were identical, except that the 2009 questionnaire had one additional item, a question about seizure frequency over the past two years. This item was not included in the 1999 questionnaire because, at that time, seizure frequency was not relevant to driver eligibility; antiepileptic therapy was a contraindication *per se*, and all examinees in that study were taking antiepileptic drugs.

For statistical analysis, the chi-square test was used. The test of proportions was performed in cases where one of the analyzed subgroups was too small to use chi-square.

**Results:** In 1999, 277 subjects were polled, while in 2009 we questioned 317 PwE. Table 1 presents some differences in driving behaviour of PwE before and after the partial liberalization of legislation in 2005. After the liberalization, a higher percentage of this patient sample drove and a lower percentage drove without a driver's licence, but these results did not reach statistical significance at  $p < 0.05$ . However, if only the percentage of drivers with driving licences are compared, in 2009 a statistically higher percentage of PwE who drive was recorded.

In 1999, there were 130/277 (46.9 %) PwE with driving licences. According to the regulations that were in force, all of those driving licences were illegal because all examinees were taking antiepileptic therapy, which was contraindicated for getting the driving licence. Despite of possession of the driving licence, only 105/130 (80.8 %) of persons from that group were participating in traffic as motor vehicle drivers. In 2009, 171/317 (53.9 %) PwE possessed driving licences and 88.3 % (151/171) were participating in traffic. This difference between 1999 and 2009 was not found to be statistically significant.

The results of self-assessment of the degree of participation in traffic of PwE in comparison with other drivers are presented in Table 2. As it can be seen, in the year 2009, 4.5% of respondents declared themselves to drive more often than others ( $p = 0.021$ ), while in both years cca 1/3 of respondents answered that they drove less often than other drivers.

In Table 3, the group of PwE who have driving licences is stratified according to the seizure frequency in previous two years, and the percentage of those who participate as drivers is presented. It was found that in the subgroup of PwE in remission most of them participated in traffic, while in the subgroup of PwE with higher

number of seizures the examinees answered they were driving less often than other drivers. Statistically significant differences were obtained when comparing subgroup without seizures with the subgroup with 5-10 seizures ( $p=0.002$ ), and with the subgroup with  $>10$  seizures ( $p=0.011$ ).

In Table 4, changes in types of motor vehicles driven by PwE are presented (1999 vs 2009). There were no changes in rates of driving cars and tractors, but in 2009 there was a greater proportion of PwE who drove motorcycles ( $p<0.01$ ). In 1999 one person with epilepsy was driving 1.13 motor vehicles, while in 2009 slightly more - 1.29.

**Discussion:** The high proportion of PwE in Croatia who illegally obtained driver's licences during the ban (prior to 2005) indicates the inefficiency of these restrictive regulations. Obviously, the majority of patients taking antiepileptic drug therapy that wanted a driver's licence obtained one, and were prepared to break the law by denying their seizure and therapy status. Such a behavior is probably facilitated by strong reluctance of physicians to report their patients to the authorities. One could suppose that under these circumstances negative psychological consequences with higher grade of perceived stigmatization might have been expected. Very similar results were obtained in Japan. In a 1992 study, 49% of epilepsy patients still drove motor vehicles despite a complete ban [15]. Based on this information and results from other countries, one could argue that non-compliance of PwE is one argument for liberalization of driver's licence regulations [14, 16-20].

After partial liberalization in 2005, a great part of PwE in Croatia could have driving licences according to regulations (60% of drivers with driving licence were in remission in previous two years), the fact that improved their legal position and that might have induced a positive psychological shift [1-3]. Consequently, based on these data, the rate of PwE with driving licences in Croatia became comparable with some other European countries: Sweden  $>50\%$  [21], Germany 45% [21] and Netherland 52% [23].

In addition to the higher rate of licenced drivers compared to 10 years earlier, the proportion of people who were driving without a licence decreased more than two fold to  $<2\%$  by 2009. Furthermore, 1/3 of all patients reported driving less often than other drivers, and this too may be interpreted as a positive sign indicating that patients do take their seizure frequency into account when choosing to drive (or not). Indeed, the proportion of patients who reported driving less than average was about the same



before and after the liberalization. In addition, the frequency of driving was inversely proportional to seizure frequency, indicating considerably caution amongst PwE with driver's licences. This information might be taken into account when one considers experiences from other countries which indicate that liberalization of legislation generally does not cause an increase of the traffic accident number [24-26].

While these results are generally encouraging, other developments may be cause for concern. Although small in number (< 5%), some subjects in the 2009 survey reported driving more often than average, compared to no one in the 1999 poll. Furthermore, in 2009 there were significantly more PwE who reported driving motorcycles. These potentially negative trends might be the consequence of absent or inadequate counselling of patients on issues related to driving. Only basic information about driving regulations can be found on the official website of the Croatian Association for Epilepsy. According to the personal experiences of the authors, the physicians in Croatia, although aware of the lack of knowledge of their patients, avoid the issue for fear of having to report a patient to the authorities. Studies from several countries emphasize the importance of patient education. In Ireland, 78.8% of those polled were aware that they should not drive if their seizures were not fully under control, but awareness of legal regulations was very low (9-34.6% correct answers) [27]. A study performed in two large American Epilepsy Reference Centers revealed that about 50% of patients with newly diagnosed epilepsy did not have necessary information regarding the legal restrictions on driving [28].

The presented data examined only some behavioural aspects of driving in patients with epilepsy before and after liberalization of driving regulations. Although this study provided several arguments in favour of liberalization, it did not examine the central question of whether participation in traffic by PwE results in more traffic accidents. In addition, we are not aware of factors that might have influenced the provided responses, in such a kind of study the possibility of responder bias must always be taken into consideration.

In conclusion, our survey confirmed a high grade of inefficiency of restrictive and unselective regulations. Based on the obtained results, we think that PwE who participate in traffic showed to have a significant grade of self-criticism, which could be used as an additional argument in favour of liberalization of driving licence regulations. However, to prevent the undesirable effects of liberalization, it is important that liberalized rules are accompanied by appropriate counselling programs.

**Acknowledgments:** We kindly thank Mr. Mike Glynn, President of the International Bureau for Epilepsy, for his support in creating this manuscript.

## References:

[1] Gilliam F, Kuzniecky R, Faught E, Black L, Carpenter G, Schrod R. Patient-validated content of epilepsy-specific quality of life measurement. *Epilepsia* 1997;38:233-6.

[2] Beran RG. Epilepsy and law. *Epilepsy Behav* 2008;12:644-51.

[3] Krumholz A. Driving issues in epilepsy: past, present, and future. *Epilepsy Curr* 2009;9:21-35.

[4] Somerville ER, Black AB, Dunne JW. Driving to distraction—certification of fitness to drive with epilepsy. *Med J Aust* 2010;192:342-4.

[5] Hansotia P, Broste SK. The effect of epilepsy or diabetes mellitus on the risk of automobile accidents. *N Engl J Med* 1991;324:22-6.

[6] Sonnen A. Epilepsy and driving: A European View. Paswerk Bedrijven, Haarlem: International Bureau for Epilepsy. 1997:11-32.

[7] Second European Working Group on Epilepsy and Driving, an advisory board to the Driving Licence Committee of the European Union. Epilepsy and Driving In Europe. Available at:  
[http://ec.europa.eu/transport/roadsafety/behavior/doc/epilepsy\\_and\\_driving\\_in\\_europe\\_final\\_report\\_v2\\_en.pdf](http://ec.europa.eu/transport/roadsafety/behavior/doc/epilepsy_and_driving_in_europe_final_report_v2_en.pdf). Accessed January 13 2011.

[8] Ooi WW, Gutrecht JA. International regulations for automobile driving and epilepsy *J Travel Med* 2000;7:1-4.

[9] Official Journal of the European Union. Available at:  
<http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:223:0026:0030:EN:PDF>. Accessed January 13 2011.

[10] Krumholz A. The Commentary. AHRQ 2004. Available at:  
<http://www.webmm.ahrq.gov/case.aspx?caseID=85#commentary>. Accessed January 13 2011.

[11] Pravilnik o zdravstvenim uvjetima koje moraju ispunjavati vozači motornih vozila. Službeni list SFRJ 1975; 20:691-4.

[12] Pravilnik za obavljanje zdravstvenih pregleda, vrsti i opsegu pregleda, načinu vođenja evidencije i medicinske dokumentacije vozača i kandidata za vozače. Narodne Novine 92/2005. Available at :  
<http://narodne-novine.nn.hr/default.aspx>. Accessed January 13 2011.

[13] Pravilnik o zdravstvenim pregledima vozača i kandidata za vozače. Narodne Novine 01/2011. Available at :  
<http://narodne-novine.nn.hr/default.aspx>. Accessed January 14 2011.

- [14] Bielen I, Duerrigl V, Hajnšek S, Krmpotić P, Šepić\_Grahovac D. Inefficiency of the unselective type of legislation for the assessment of fitness to drive in individuals with epilepsy. *Neurol Croat* 1999;48: 93-8.
- [15] Takeda A, Kawai I, Yagi K, seino M. Epilepsy and driving ban in Japan. Current status and investigated in prospective study. *J Epilepsy* 1992;5:135-9.
- [16] Parera IC, De Madariage LB, Gimeno A, Lehkuniec E. Driving regulations an epilepsy in Argentina. A novel proposal. *Medicina* 2003;63:249-55.
- [17] Beghi E, Sander JW. Epilepsy and driving. *BMJ* 2005;331:60-1.
- [18] Krumholz A, Fisher RS, Lesser RP, Hauser WA. Driving and epilepsy: a review and reappraisal. *JAMA* 1991;265: 622-6.
- [19] Schmedding E. Epilepsy and driving in Belgium: proposals and justification. *Acta Neurol Belg* 2004;104:68-79.
- [20] Bielen I. Driving and epilepsy. *Neurologica Croatica* 2007;56 (Suppl 5):102-6.
- [21] Herner B. Sudden illness as a cause of motor vehicle accidents. *Br J Ind Med* 1966; 23:37-41.
- [22] Ritter G. Epilepsie und Fuehrerschein. *Nervenarzt* 1976;47:51-3.
- [23] Van der Lugt. Traffic accidents caused by epilepsy. *Epilepsia* 1975;16:747-51.
- [24] Drazkowski JF, Fisher RS, Sirven JI, et al. Seizure-related motor vehicle crashes in Arizona before and after reducing the driving restriction from 12 to 3 months. *Mayo Clin Proc* 2003;78: 819-25.
- [25] Drazkowski J. An overview of epilepsy and driving. *Epilepsia* 2007; 48 (Suppl. 9): 10–2.
- [26] Krumholz A. To drive or not to drive: the 3-month seizure-free interval for people with epilepsy. *Mayo Clin Proc.* 2003;78:817-8.
- [27] Coker MF, Bhargava S, Fitzgerald M, Doherty CP. What do people with epilepsy know about their condition? Evaluation of a subspecialty clinic population. *Seizure.* 2011;1:55-9.
- [28] Drazkowski JF, Neiman ES, Sirven JI, McAbee GN, Noe KH. Frequency of physician counseling and attitudes toward driving motor vehicles in people with epilepsy: comparing a mandatory-reporting with a voluntary-reporting state. *Epilepsy Behav* 2010;19:52-4.

## Tables

**Table 1** Participation in traffic of PwE as motor vehicle drivers

		1999 N=277	2009 N=317	difference
Non-drivers		160 (57.8%)	160 (50.5%)	NS
Drivers	Driving licence: YES	105 (37.9%)	151 (47.6%)	p < 0.05
	Driving licence: NO	12 (4.3%)	6 (1.9%)	NS

**Table 2** Self-assessed driving frequency of PwE in Croatia

		1999 N=117	2009 N=157	difference
Degree of participation in traffic	on average	78 (66.7%)	98 (62.4%)	NS
	more rarely	39 (33.3%)	52 (33.1%)	NS
	more often	0	7 (4.5%)	p < 0.05

**Table 3** Seizure rates over the past two years in PwE with a driver's licence (2009 survey)

		Participate in traffic: N = 151
without seizures	103 (60.2%)	96/103 (93.2%)
<5 seizures	52 (30.4%)	45/52 (86.5%)
5-10 seizures	11 (6.4%)	7/11 (63.6%)
>10 seizures	5 (2.6%)	3/5 (60.0%)

**Table 4** Changes in types of motor vehicles driven by PwE

	1999 Number of drivers: 117	2009 Number of drivers: 157	difference
motorcycle	13/117 (11.1%)	39/157 (24.9%)	p < 0.01
car	101/117 (86.3%)	138/157 (87.9%)	NS
tractors	19/117 (16.2%)	27/157 (17.2%)	NS
others	3/117 (2.9%)	1/157 (0.6%)	NS