Safety Performance of Drivers with Medical Exemptions:

How safe are drivers in a medical exemption program compared to those who are not?

INTRODUCTION

For commercial motor vehicle (CMV) drivers, safety performance depends not only on the condition of the vehicle being driven but also on the driver's ability to operate it. Because factors such as stopping time and distance, blind spots, and limited maneuverability pose greater challenges for the driver of a large truck or bus than for drivers of other vehicles, it is crucial that all large truck and bus drivers be in good medical condition for driving. The Federal Motor Carrier Safety Administration (FMCSA) has established medical exemption programs to safeguard against the employment of large truck and bus drivers who may have conditions that could compromise their driving ability and, ultimately, affect their safety and the safety of others on the road. Checking the success of these programs is essential to ensuring everyone's safety on the road.

BACKGROUND

In accordance with 49 U.S.C. 31315(b), upon receipt of a request, FMCSA may grant an exemption from the physical standards for CMV drivers (in 49 CFR 391.41) if the Agency finds that the exemption would be likely to achieve a level of safety that is equivalent to, or greater than, the level that would be achieved in the absence of the exemption. When a request is filed, FMCSA publishes a notice in the *Federal Register* and posts in a public docket, accessible via the internet, information explaining the request. The purpose is to give the public an opportunity to inspect the safety analysis and any other relevant information known to FMCSA, and to comment on the request before FMCSA makes a decision to grant or deny the exemption. The applicant also must authorize FMCSA to disclose, in the public docket, medical records and information, which may include specific health information related to medical conditions or illnesses, injuries, diagnoses, prognoses, and medical treatments that have disqualified the applicant from obtaining a medical certificate to operate CMVs in interstate commerce, without an exemption.

In some cases, FMCSA can issue an exemption for a maximum of 2 years, after which time the driver must apply for a renewal of that exemption. This analysis reviews the safety performance of drivers in four FMCSA medical exemption programs: Diabetes, Vision, Hearing, and Seizure.

Vision: The Vision Exemption Program is the oldest of the four, having gone into effect in 1998. To obtain this exemption, drivers must be qualified under all the other physical standards in 49 CFR 391.41 without any other waivers or exemptions. Applicants must be examined by an ophthalmologist or an optometrist who certifies that in his/her medical opinion the driver has sufficient vision to perform the driving tasks required to operate a CMV. As of June 2016, there were 2,590 CMV drivers with vision exemptions.

Diabetes: The Diabetes Exemption Program, to allow a driver to use insulin while operating a CMV in interstate commerce, has been in effect since 2003. To obtain the exemption, the applicant must meet all medical standards and guidelines, other than diabetes, in accordance with 49 CFR 391.41, and must be examined by a certified medical examiner who will review the driver's medical history over the past 5 years. The applicant also must be examined by a physician who is a board-certified or board-eligible endocrinologist, and must have a vision examination by an ophthalmologist or optometrist. Quarterly and annual medical monitoring and reporting are conditions of the exemption. As of June 2016, there were 2,935 drivers with diabetes exemptions.

Hearing: The Hearing Exemption Program has been in effect since 2013. To obtain the exemption, the applicant must submit a request for exemption from 49 CFR 391.41(b)(11), which prohibits an individual who does not pass the hearing requirement from operating a CMV in interstate commerce. The request requires the applicant to provide a description of the exemption being sought and the medical information to be released to FMCSA in support of the exemption application,

including the identities of healthcare professionals responsible for providing the records to be released. As of June 2016, there were 217 drivers with hearing exemptions.

Seizure. The Seizure Exemption Program also has been in effect since 2013. To obtain the exemption, the applicant must submit a request for exemption from 49 CFR 391.41(b)(8), which prohibits an individual who has an established medical history or clinical diagnosis of epilepsy or any other condition that is likely to cause loss of consciousness or any loss of ability to control a CMV, from operating a CMV in interstate commerce. The applicant must submit information related to the condition, such as diagnosis, medical history, laboratory tests, diagnostic tests, and any medications being taken, as well as a note from the treating physician about the applicant's most recent visit and a Physician Statement, on letterhead, that includes diagnosis, date(s) of last seizure, anti-seizure medication being taken, date of most recent change in anti-seizure medication, and a statement from the physician supporting that the applicant should be able to drive commercially. As of June 2016, there were 162 drivers with seizure exemptions.

Figure 1 shows the number of drivers granted medical exemptions by year for each program. The seizure exemption program has been stable, with an average of 73 exemptions granted in each of the first 3 years. The other programs have shown increasing trends. For example, in 2015 the diabetes exemption program granted nearly 1,000 exemptions.

PURPOSE

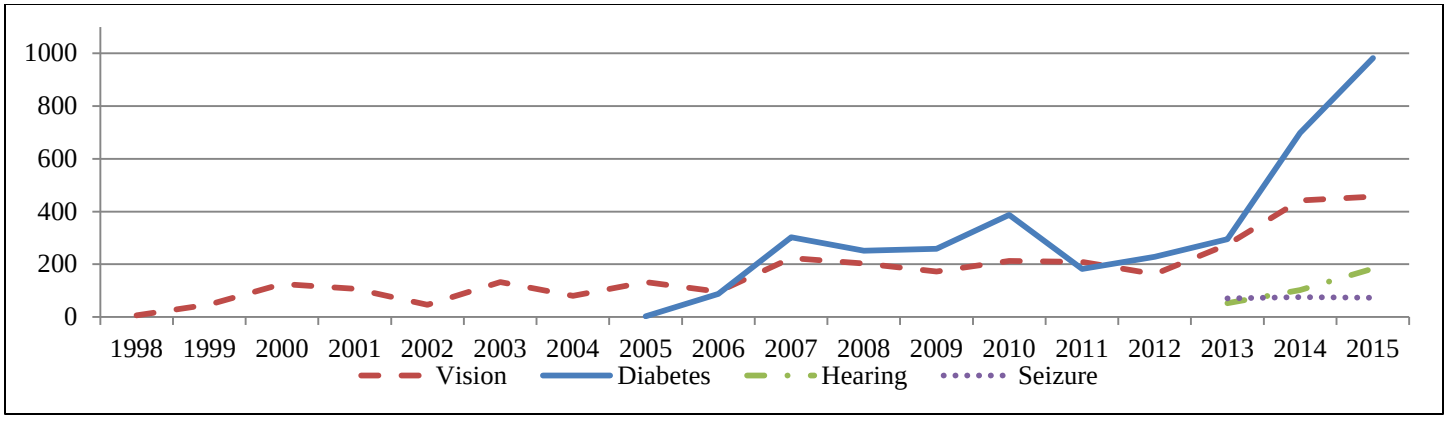
The purpose of this study was to determine how safe CMV drivers enrolled in FMCSA's medical exemption programs are in comparison with drivers not enrolled in any of the programs. Drivers in the programs were assessed in terms of their crash rates (crashes per driver per year) and inspection violation rates. To allow comparisons with CMV drivers not in the FMCSA medical exemption programs, treatment groups and control groups were established by using the Driver Information Resource (DIR), which captures drivers' driving histories over the past 5 years.

TREATMENT GROUPS

Four different treatment groups were created in order to evaluate the four different exemption programs. Initial lists of drivers from each program were organized into groups according to their exemption program enrollment dates. These lists were evaluated to determine which time periods (1 year, 2 years, etc.) would maximize the number of drivers in each treatment group.

For both the diabetes and vision programs, FMCSA assessed the safety performance of drivers in the programs for a period of 5 years. Thus, it was required that drivers carry active waivers in their respective program for 5 full years, from 2011 through 2015. Those who did not fit into this time frame were removed from consideration, so as not to bias the study's findings. For the hearing and seizure programs, 1 year of data resulted in the maximum number of drivers for the treatment group. As such, it was required that drivers carry active waivers in their respective programs for a period of 1 full year, from June 1, 2015, to May 31, 2016. As with diabetes and vision exemption drivers, those who did not fit into the specified time period were removed from consideration for the treatment groups. The initial numbers of drivers in each program available for the analysis were 755 diabetes exemption drivers, 1,117 vision exemption drivers, 218 hearing exemption drivers, and 179 seizure exemption drivers.

Figure 1. Line graph. Number of drivers granted medical exemptions by program by year, 1998–2015.



The DIR was then searched, and drivers with no inspection records in the DIR were excluded from the analysis. This restriction, although it reduced the number of drivers with exemptions to be included in the analysis, was necessary because drivers in the control group were selected from the DIR, and in order to be in the DIR they must have had an inspection or a crash. Therefore, to ensure a fair comparison, the treatment group was limited to drivers who also had data in the DIR. After this matching process, the numbers of drivers in each program who had records in the DIR were as follows: 303 diabetes exemption drivers, 693 vision exemption drivers, 37 hearing exemption drivers, and 36 seizure exemption drivers. These drivers made up the four treatment groups.

CONTROL GROUPS

To establish control groups of drivers for comparison with the treatment groups, it was important to select drivers with characteristics similar to those in the respective treatment groups. To this end, study analysts first determined the age breakdown of drivers in each treatment group. Figure 2 shows the percentage of drivers by age groups of 25–50 years, 51–65 years, and 66–81 years for each of the exemption types. It is clear that each treatment group had slightly different demographics in terms of age, which prompted the creation of four separate control groups to accommodate the differences. Of note, the majority of drivers in the hearing treatment group fell into the 25–50 years age group, whereas in the three other groups, the majority of drivers fell into the 51–65 years age group.

To further understand the characteristics of the drivers in each treatment group, study analysts also considered the sizes of the carriers employing the drivers. This is a key consideration, because drivers in larger companies, taken as a whole, tend to have lower crash rates than drivers in smaller ones. Study analysts further divided the drivers in each of the treatment groups into carrier size groups, based on the carriers' total numbers of power units, as follows: 1–20 power units, 21–50 power units, 51–100 power units, 101–150 power units, 151–1,500 power units, and more than 1,500 power units. Using these categories, along with the age group categories discussed above, study analysts determined the percentage of drivers in each of the age group and carrier size category combinations, as shown in Tables 1–4. This process provided a more detailed view of the treatment groups, which allowed for the creation of more closely matched control groups. [**Note:** Due to the small sizes of the hearing and seizure control groups, it was necessary to modify the age group distributions to ensure sufficient drivers in cells when creating cross-sections by carrier size.]

Figure 2. Bar graph. Age group distributions of treatment groups by exemption type.

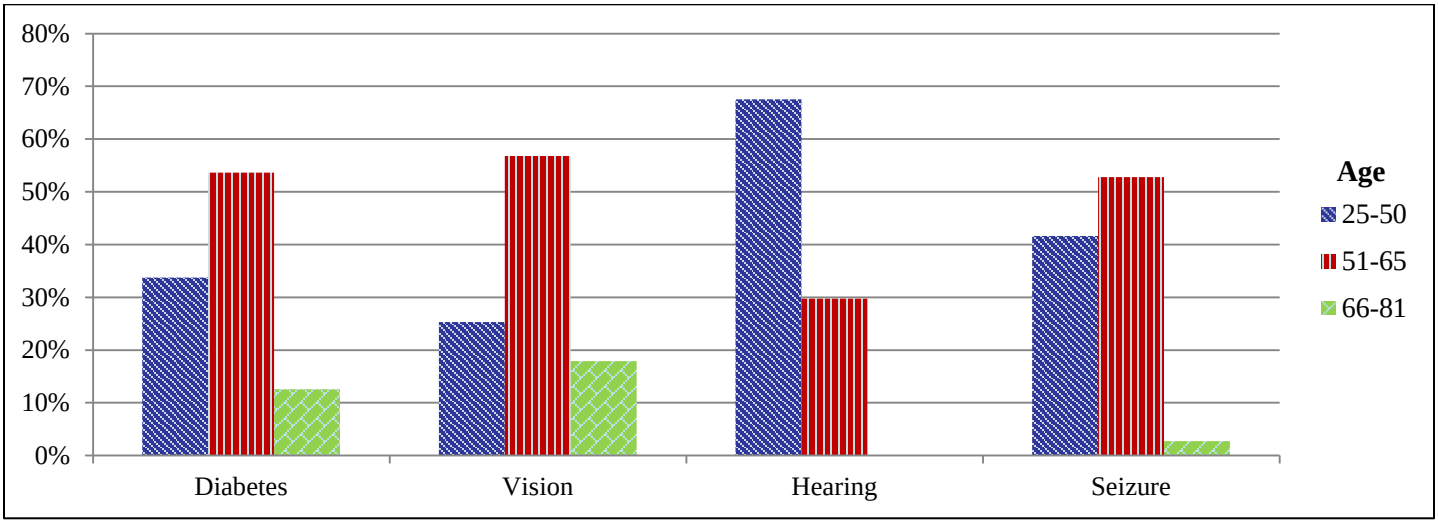


Table 1. Distribution of treatment group drivers by age and carrier size—diabetes.

Age Group	1–20	21–50	51–100	101–150	151–1,500	> 1,500
20–40	15.23%	3.64%	1.99%	0.66%	4.97%	7.28%
41–60	24.17%	7.62%	3.31%	2.98%	9.60%	5.96%
61–70	5.96%	1.99%	0.66%	0.00%	2.32%	1.66%

Table 2. Distribution of treatment group drivers by age and carrier size—vision.

Age Group	1–20	21–50	51–100	101–150	151–1,500	> 1,500
20–40	9.52%	2.16%	4.47%	3.46%	2.89%	2.74%
41–60	24.82%	2.60%	12.84%	7.22%	5.05%	4.33%
61–70	10.53%	0.72%	3.17%	1.88%	1.15%	0.43%

Table 3. Distribution of treatment group drivers by age and carrier size—hearing.

Age Group	1–20	21–50	51–100	101–150	151–1,500	> 1,500
20–40	16.22%	0.00%	0.00%	0.00%	5.41%	13.51%
41–60	13.51%	8.11%	0.00%	2.70%	16.22%	21.62%
61–70	0.00%	0.00%	0.00%	0.00%	0.00%	2.70%

Table 4. Distribution of treatment group drivers by age and carrier size—seizure.

Age Group	1–20	21–50	51–100	101–150	151–1,500	> 1,500
20–40	11.11%	2.78%	0.00%	2.78%	8.33%	2.78%
41–60	16.67%	5.56%	5.56%	2.78%	16.67%	13.89%
61–70	2.78%	2.78%	0.00%	2.78%	2.78%	0.00%

Some differences in the sizes of the carriers associated with the drivers receiving exemptions are evident across the treatment groups. For example, for both the diabetes and vision treatment groups, about 45 percent of the drivers were employed by the smallest carriers (with 1–20 power units), whereas for the hearing and seizure treatment groups, about 30 percent of the drivers were employed by the smallest carriers. Also, 38 percent of the drivers in the hearing treatment group were employed by the largest carriers (with more than 1,500 power units). No other treatment group had more than 17 percent of its drivers in the largest carrier size group.

The percentage distributions of treatment group drivers by age and carrier size were used to select drivers from DIR for the control groups. For selection to a control group, the driver could not be in an exemption program and had to have had at least one inspection in each of the years corresponding to the respective treatment group: from 2011 through 2015 for the diabetes and vision control groups, and from June 1, 2015, through May 31, 2016, for the hearing and seizure control groups. Drivers were chosen at random and added to each control group in proportion to the age and carrier size distributions of the corresponding treatment groups until the control groups contained three times as many drivers as their respective treatment groups.

ANALYSIS

Because the sizes of the hearing and seizure treatment groups were small, and crashes in general were rare events for all treatment groups, study analysts first conducted a comparison of crash information for the total 5-year and 1-year populations of exemption program drivers with national data to determine whether the approach for analyzing treatment groups compared to control groups would provide realistic results. Crash rates for diabetes and vision exemption drivers, expressed in terms of total crashes per driver per year, were thus initially compared to similar rates for the national fleet, obtained from the Motor Carrier Management Information System (MCMIS) for the period from 2011 through 2015, based on the average number of crashes reported to MCMIS in that time frame, divided by the average number of drivers employed by carriers as reported in the MCMIS census file of carrier registration data (see Table 5). For the hearing and seizure exemption drivers, MCMIS data for 2015 were used.

These national crash rates were compared to crash rates for drivers in each of the exemption programs, based on the drivers in each program during these time periods (as described above in the first step for establishing the treatment groups) and the crashes in DIR for those drivers. (In this initial step, all drivers with medical exemptions were captured if the exemptions were found to be valid for the entire time period). Because the exemption program crash rates were of the same order of magnitude as the rough approximations of national crash rates, the analysis proceeded with comparing the crash rates for the treatment and control groups.

Table 5: Crash rates for exemption program drivers compared to national crash rates, crashes per driver per year.

Time Period	Exemption Program	Number of Exemption Drivers	Number of Exemption Driver Crashes	Exemption Crash Rate (Crashes per Driver per Year)	National Average Annual Number of Drivers	National Average Annual Number of Crashes	National Crash Rate (Crashes per Driver per Year)
2011–15	Diabetes	755	58	**0.01536**	4,599,623	143,289	**0.03115**
2011–15	Vision	1,117	144	**0.02578**	4,599,623	143,289	**0.03115**
2015	Hearing	218	4	**0.01835**	5,335,663	157,730	**0.02956**
2015	Seizure	178	3	**0.01685**	5,335,663	157,730	**0.02956**

The first comparison of treatment groups to control groups was for crash rates (see Table 6). Statistical significance testing was conducted at the 95 percent level of confidence, to determine whether any differences in crash rates were statistically significant. The crash rates for drivers in the diabetes and hearing exemption treatment groups were not statistically different from their control groups. However, the rate for the vision exemption treatment group was statistically different from its control group, being slightly higher at 0.03853 crashes per driver per year than the control group rate of 0.02819. This equates to about one more crash per year for every 100 drivers in the vision exemption program than for similar drivers not in the vision exemption program. The results for the seizure exemption treatment group were also statistically different from its control group, at 0.02942 compared to 0.14815 crashes per driver per year. This equates to an estimated 12 fewer crashes involving seizure exemption program drivers than the number involving similar drivers not in the seizure exemption program. However, it must be noted that the numbers of drivers in both the hearing and seizure treatment groups are very small, based on only 1 year of data, and therefore the levels of accuracy for the crash rates, as measured in this study, may be questionable due to unknown biases. It is recommended that a similar analysis be conducted after the program has been in place for a sufficient period of time to allow larger numbers of drivers and crashes to be included in the comparisons.

The next comparison involved driver violations discovered during roadside inspections. For each treatment group and control group, a violation rate based on the average number of driver violations per driver was calculated (see Table 7). In all the comparisons, the treatment group had a lower violation rate than its control group, with the differences for the vision, hearing, and seizure exemption program treatment groups being statistically significant.

Table 6. Comparison of treatment group and control group crash rates, crashes per driver per year.

Exemption Program	Number of Treatment Group Exemption Drivers	Treatment Group Exemption Driver Crash Rate	Control Group Crash Rate	Statistically Significant Difference
Diabetes	288	0.02986	0.02627	No
Vision	680	0.03853	0.02819	Yes
Hearing	35	0.05714	0.14414	No
Seizure	34	0.02941	0.14815	Yes

Table 7. Comparison of treatment group and control group driver violation rates.

Exemption Program	Number of Treatment Group Exemption Drivers	Treatment Group Driver Inspection Violation Rate	Control Group Driver Inspection Violation Rate	Statistically Significant Difference
Diabetes	288	2.1250	2.2009	No
Vision	680	1.9721	2.4911	Yes
Hearing	35	0.5714	4.1712	Yes
Seizure	34	0.6471	4.7315	Yes

The differences between the rates for the treatment and control groups for the hearing and seizure exemption programs are quite large, but because the sample sizes are small, and the analysis was based on only 1 year of data, caution is recommended in interpreting the results despite the findings of statistical significance.

Table 8 shows results for a similar set of comparisons, considering driver out-of-service (OOS) violations discovered during roadside inspections. As before, treatment group and control group OOS rates are based on the average number of driver OOS violations per driver. The treatment groups had lower OOS violation rates in all instances, with vision, hearing, and seizure exemption program comparisons being statistically significant. Again, because of small sample sizes and only 1 year of data for these particular treatment groups, caution is recommended in interpreting the results for the hearing and seizure exemption program comparisons.

CONCLUSIONS

After comparing all treatment groups to their respective control groups, drivers in the exemption programs generally had lower rates across the board, except for the case of the vision treatment group's crash rate. Further studies should be done using larger sample sizes, particularly for the hearing and seizure exemption programs (since these two programs only began in 2013), to confirm or challenge the results seen in this study.

Table 8. Comparison of treatment group and control group OOS driver violation rates.

Exemption Program	Number of Treatment Group Exemption Drivers	Treatment Group Driver Inspection OOS Rate	Control Group Driver Inspection OOS Rate	Statistically Significant
Diabetes	288	0.22222	0.30574	No
Vision	680	0.22353	0.29870	Yes
Hearing	35	0.11429	0.36937	Yes
Seizure	34	0.02941	0.50000	Yes