# 3. The "speed" activity in the first national road safety program in Croatia

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In order to decrease the speed and the degree of traffic danger on some arterial roads, the town of Zagreb has introduced speed limits on these roads higher than the general speed limit for the inhabited areas, a year ago.

In this paper some of the results of this experiment are presented and discussed, based on the evaluation study carried out for the purpose of this project.

## *3.1. INTRODUCTION*

In the first National road safety program in Croatia, established by the Government 17. June, 1994, the activity "speed" was established as one of four safety activities.

Its intention was to reduce the speed of the vehicles on our roads generally, and the special objective was supposed to be: the respect of the highest allowed speed on 85% of the roads, with the acceptable exceeding of the limit for at most 10 - 15%.

In the operational plan for this part of the program a number of various activities were planned, and their realization started by the beginning of 1995. As the activities are still ongoing, we cannot speak about the achieved results, but it seems sure that they will be just selective.

Although not directly, but as a part of the realization of the National program, and on the path of the entirely identical meaning and the objectives defined in the Program, and synchronously with it, the experimental program of the introduction of higher (i.e. more adequate) speed limits on some of the "fast" city roads was introduced in Zagreb.

That experiment was carried out based on a previous study, which was realized on a number of arterial roads in the town, and on the conclusion to start with the speed limits higher than for the inhabited areas experimentally and selectively. For that purpose four city roads were chosen, for which it was estimated that they had the best preconditions for higher limits, and the new higher limits for them were set between 70 and 90 km/h.

It was also established that this experimental project should last for a year; from June 1994 to June 1955. Some of the results of this experiment are shown in this paper.

## *3.2. THE PROBLEMS*

The evaluation study should establish the effects of the project of higher speed limits introduction and whether the defined objective - decrease of real speed and decrease of danger- has been attained, and to which extent.

According to this, the conclusion could be made as to what to do after the experimental period, on these as well as on other similar roads.

## 3.3. METHODS OF OPERATION

Since a few different effects could have been expected from the introduction of higher limits, the following proportions were monitored:

- traffic flow,
- the speed characteristics of traffic,
- the rate of incidents on particular road sections,
- the attitudes and opinions of the drivers.

And parallel to this, all of the preventive actions were monitored; (from the operational plan of the National program), which were, together with the established new higher limits, supposed to attain the defined objectives.

Beside the chosen roads, some similar roads were monitored for the purpose of control, so that the possible effect of some other factors and circumstances to these "criteria" indicators could be monitored.

The monitoring of all four indicators was carried out in four subsequent periods, which was supposed to give the image of the situation:

- immediately after the introduction of higher limits,
- three months later,
- six months later, and
- a year later,

on the experimental and control roads.

The traffic flow was monitored by round-the-clock filming under the usual conditions of traffic.

The speed characteristics of the traffic flow were established on the vehicles in the circumstances of a free traffic flow; (time of monitoring at least 5 seconds), and in the conditions of day-time visibility, with a civil radar and without the knowledge of the drivers.

The rate of the incidents of particular sections was established on the basis of the police records of accidents, and the risk analysis was made by a special computer program - "IISSPCM"; (from the information about the accidents and their consequences, and from the data about the traffic flow on that sections).

The attitudes and opinions of the road users were established by questionnaires for the drivers, at two different points on the experimental roads.

## 3.4. THE RESULTS

### 3.4.1. Traffic flow

During the monitored period the intensity was increased on all roads, for an average of 2%, and without some recognizable changes in their structure. There were no differences between the experimental and control sections of the roads, thus we can conclude that higher speed limits had no impact on the proportion and structure of the traffic flaw, which was to be expected.

## 3.4.2. The speed

Pictures 1, 2, and 3 there present the following characteristics: average speed, the speed of the 85th percentile, and the coefficient of the speed variation on the experimental and control sections, "before" and 4, and 12 months "after" the introduction of the higher limits.

On all the experimental sections there was a tendency of decreasing the average speed, and on all the control sections, these speeds, as well as average speeds were increased or the same as in the previous period.

The speed of the 85th percentile was reduced on almost all the experimental sections, and on the control sections, these speeds were increased as well as average speeds in relation to the previous period or they were the same.

On the control sections the dispersion of speeds was reduced or remained at the same level. On the experimental sections different tendencies were noticed. On some of them the dispersions of the speed were reduced - which is good, on some of them they remained the same, and on some of them the differences were even increased, which is not good.

On all the control sections the average exceeding of the speed limit was increased, which, of course is not good.

The fact whether these changes are the results of incidental variations or the consequence of higher limits and other activities was checked by the use of the statistical test of significant differences - "T-test".

In Table 1, we present the results of the application of T-test on the speeds in the phase "before" and at the end of the phase "after", i.e. at the end of the 12 months period after introducing experimental higher limits.

| SECTION | T - RESULT | DEGREE OF FREEDOM |
|---|---|---|
| 01 | 5,54* | 176 |
| 02 | 0,49 | 174 |
| 03 | 4,08* | 178 |
| 04 | 3,95* | 174 |
| 05 | 1,10 | 172 |
| 06 | 5,93* | 173 |
| 07 | 0,54 | 173 |
| 08 | 5,81* | 172 |
| 09 | 2,15* | 184 |
| 10 | 2,17* | 175 |
| 11 | 2,39* | 178 |

Table 1:
*The significance of the differences between sections, "before" and (12 months) "after".*

***Note**: " * " indicates the statistically significant difference at the level of 95% probability.*

As it is evident, the significant decrease of the speed on almost all the experimental sections is noted.

### 3.4.3. The accident risk

The accident risks in the monitored years, for both, experimental and control sections, are shown in Table 2, and Table 3.

| SECTION | YEAR | | | | CHANGE (%) |
|---|---|---|---|---|---|
| | 1993 | 1994 | 93-94 | 1995 | |
| 01 | 9,8 | 9,3 | 9,6 | 8,0 | - 17 |
| 05 | 9,3 | 8,1 | 8,2 | 11,2 | + 37 |
| 06 | 1,1 | 0,9 | 1,0 | 1,0 | - |
| 07 | 2,6 | 4,0 | 3,3 | 7,1 | + 115 |
| 08 | 2,7 | 6,8 | 4,8 | 4,5 | - 6 |
| 09 | 10,1 | 11,7 | 10,9 | 5,8 | - 47 |
| 10 | 4,9 | 4,0 | 4,5 | 1,8 | - 60 |
| 11 | 4,1 | 2,0 | 3,1 | 4,6 | +48 |
| *Average* | *5,5* | *5,9* | *5,7* | *5,5* | *- 4* |

Table 2:
*The accident risk on the experimental sections*

| SECTION | | Y E A R | | | CHANGE (%) |
|---|---|---|---|---|---|
| | 1993 | 1994 | 93-94 | 1995 | |
| 02 | 7.4 | 4.9 | 6.2 | 3.6 | - 42 |
| 03 | 4.5 | 6.3 | 5.4 | 8.5 | + 57 |
| 04 | 4.9 | 5.8 | 5.4 | 5.3 | - 2 |
| *Average* | *5.6* | *5.7* | *5.7* | *5.8* | *+ 2* |

Table 3:
*Traffic accident risk on control sections*

If one observes road sections in groups - experimental and control sections, the following tendencies can be seen:

a) experimental sections

- risk level in the period "before" - 5.7,
- risk level in the period "after" - 5.5,

which corresponds to the decrease of the average risk level for about 4%;

b) control sections

- risk level in the period "before" - 5.7,
- risk level in the period "after" - 5.8,

which corresponds to the increase of the average risk level for 2%.

If, then, the risk level has in the mean time increased a little, or at worst, it has stagnated, the risk level at experimental sections has slightly decreased, which is obviously the effect of introduced higher limits and other activities which have been being carried out.

It should be said that the degree of the decrease in risk of traffic accidents is very similar to the degree of decrease in actual speed, which can be seen in the following tables: 4, 5 and 6.

| SECTION | BEFORE | AFTER | CHANGE (%) |
|---|---|---|---|
| 01 | 86 | 77 | - 11 |
| 05 | 82 | 80 | - 3 |
| 06 | 92 | 79 | - 14 |
| 07 | 86 | 85 | - 1 |
| 08 | 83 | 74 | - 10 |
| 09 | 89 | 85 | - 5 |
| 10 | 74 | 70 | - 5 |
| 11 | 78 | 74 | - 5 |
| *Average* | *84* | *78* | *- 7* |

Table 4:
Change in the average speed at experimental sections (km/h)

| SECTION | BEFORE | AFTER | CHANGE (%) |
|---|---|---|---|
| 01 | 97 | 88 | - 9 |
| 05 | 98 | 91 | - 7 |
| 06 | 102 | 93 | - 9 |
| 07 | 96 | 96 | 0 |
| 08 | 95 | 82 | - 14 |
| 09 | 106 | 93 | - 12 |
| 10 | 82 | 78 | - 5 |
| 11 | 88 | 80 | - 9 |
| *Average* | *96* | *88* | *- 8* |

Table 5:
*Changes in speed of the 85th percentile at the experimental sections (in km/h)*

| SECTION | BEFORE | AFTER | CHANGE (%) |
|---|---|---|---|
| 01 | 14.1 | 12.2 | - 13 |
| 05 | 15.0 | 16.1 | + 7 |
| 06 | 14.7 | 17.6 | + 20 |
| 07 | 12.5 | 12.7 | + 2 |
| 08 | 12.9 | 11.3 | - 12 |
| 09 | 17.3 | 12.5 | - 28 |
| 10 | 10.4 | 10.8 | + 2 |
| 11 | 13.6 | 12.8 | - 6 |
| *Average* | *13.8* | *13.2* | *- 4* |

Table 6:
*Changes in variation coefficient at the experimental sections*

Therefore, the decrease in risk of traffic accidents - of 4% - highly corresponds to the decrease of speed at the experimental sections; of the average speed for 7%, of the 85th percentile speed for 8%, and of the variation coefficient for 4%.

That these changes in speed are the indicators and predictors of the traffic accident risks, has been shown by the regression analysis carried out between: the average speed and traffic accident risk for the status "after", which has established the correlation coefficient between these values from 0.44. To be sure, this value is not statistically significant at the level of 95% probability, but it is surely near to being significant, and therefore important.

### 3.4.4. Attitudes and opinions of the road users

The level of drivers' familiarity with the values of limits at certain places has increased from the previous 57% to 83%, which speaks a lot about drivers' attitudes towards the higher limits.

At the same time, when explicitly asked about the justifiability of such step, drivers have mostly replied positively, and in most of the cases they considered the limitations justifiable.

## 3.4. DISCUSSION ON THE RESULTS

The previous results have shown that the introduction of higher speed limits on some of the main roads in the city of Zagreb has resulted in the actual speed, and in a certain decrease of the actual danger degree.

According to the noted results from numerous previous similar experiments and studies (Salusjarvi, Nilsson, Fieldwick and others); a connection between the level of speed and the risk degree significantly stronger than here established, as well as a certain "progression" and not a "digression" with the decrease of risk degree related to the changes in speed. But, two important conditions should be carried in mind.

First, the risk analysis in the period "after" covered one year period only, which is in the case of traffic accidents a short period. Therefore, the picture of the actual danger degree in the following period could be very different. Second, not all observed sections have the same number of crossings with the largest number of traffic accidents, and the accidents on crossings were observed as accidents in the section in whose structure the related crossings were in. Namely, it is very probable that the accidents on crossings are very weakly connected with the speed in the sections, and that they in fact make the real results vague.

## 3.5. CONCLUSION

The introduction of higher speed limits, together with the police observation activities and other informational and publicity activities, have led to a significant decrease of speed in almost all sections in which experimental higher limits were introduced. But, this positive "synergetic" effect, was not equally present at all road users because, despite to the general decrease of speed level, the dispersed speed values at some sections were even raised. Therefore, it could be established that most of the ("average") drivers, at the experimental sections lessened their speed values, but those who were the fastest have lessened their previous speed values insignificantly, or have not lessened them at all.

Regardless of the fact that the decrease of speed level is a positive result, a partial decrease of speed dispersion is not satisfactory.

Although, the speed level at the experimental sections has been generally lessened, the intensity of the decrease, primarily because of those (permanently) fastest drivers, is not completely satisfactory. Namely, the level of relative speed exceeding is not at some of the sections on the level to 10%, but goes between 10 and 14%.

Upon the introduction of higher limits there appeared an average risk decrease of car accidents or of the danger degree for about 4%. The value of this decrease is very close to the value of the average decrease: medium speed, speed of the 85th percentile, and the speed variation coefficient in traffic circulation at these sections.

Between the risk level of traffic accidents and the medium speed values of vehicles there is a certain connection, which has a tendency towards being statistically significant, which certainly

means that further large traffic accident risk decrease is possible to be reached with further decrease in speed, as well as with their mutual differences in traffic circulation.

The introduced higher speed limits were mostly welcomed by drivers, and similar measures at other similar places were asked for. Their significantly improved perception in relation to the perception of the speed limitations in all other places shows that the higher limits on these roads were welcomed. If one remembers everything previously said on the results we reached, it could be concluded that the introduction of higher speed limits on some of the roads was a real motion study move.

## 3.6. REFERENCES

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