

Short-term monitoring of road accident trends in Israel

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***Road safety data: collection and analysis
for target setting and monitoring performances and progress***

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Road accident trends

- under the permanent focus of road safety authorities.
- subject to long-term changes and temporal fluctuations

Typical questions:

- *Do the changes recently observed in accident/ fatality numbers indicate a significant increase/ decrease?*
- *Which safety areas were involved?*
- *Will the national safety targets be reached?*

→ the changes in the annual fatality numbers are monitored using statistical tools

Method: Research questions

- a. *Change in trend*: did the accident trends in the last year change significantly as opposed to the previous years?
- b. *Change in numbers*: did the fatality numbers in the last year change significantly as opposed to the previous years?
- c. *Control chart*: whether the processes remained within the boundaries of statistical quality control?

Data: the 2007 fatalities versus 2002-2006
Monthly time-series

Method: 13 time series

1. total fatalities
2. fatalities on rural roads
3. fatalities on urban roads
4. fatalities in accidents with young drivers
5. fatalities in accidents with professional drivers
6. fatalities in accidents with powered two-wheelers
7. pedestrian fatalities on urban roads
8. pedestrian fatalities on rural roads
9. pedestrian fatalities involving minorities (the Arab population)
10. fatalities in single-vehicle accidents on rural roads
11. fatalities in head-on accidents on rural roads
12. fatalities in accidents at rural junctions (excl. pedestrians)
13. fatalities in accidents at urban junctions (excl. pedestrians)

Method: Analysis techniques

- fitting explanatory models to the monthly numbers* of fatalities in the "before" (2002-2006) and "after" (2007) periods:
a quasi-Poisson regression (with dispersion), with time as a linear (or piecewise linear) explanatory variable, monthly effect and the number of days per month as an offset; a war-indicator
*log-transformation

a. *Change in trend* – the trend (slope of the regression line) in the "after" period is compared with the trend in the "before" period:
significance of "**breaking point**" at the end of year 2006

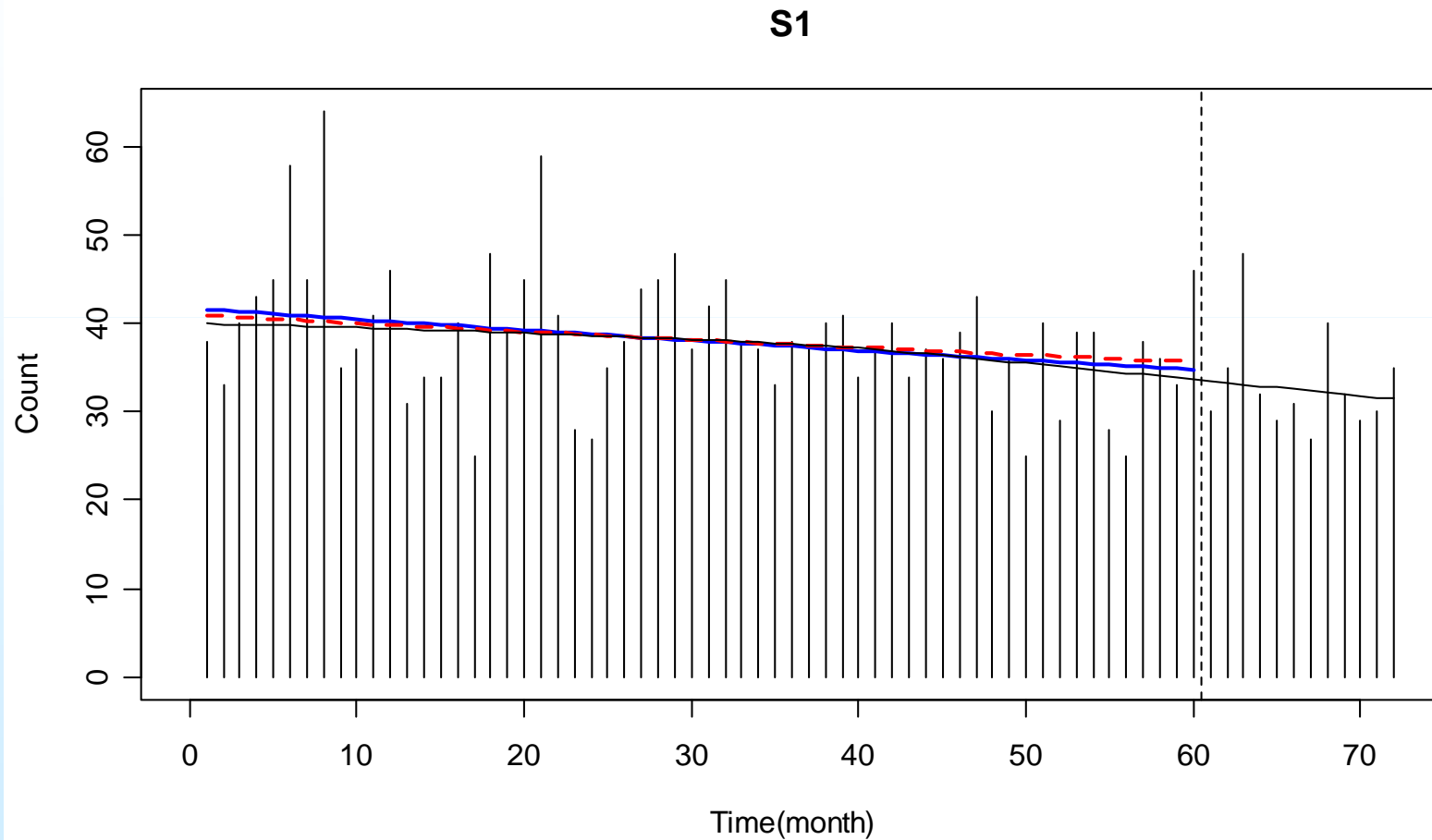
Method: Analysis techniques

b. *Change in numbers* – the average of monthly numbers of fatalities in the "after" period is compared with the same value in the "before" period:
an estimate of change with confidence interval

c. *Control chart** – fitted to the series of deviance residuals of fatality numbers:
a difference between the actual (transformed) value and the predicted by model value, for each monthly value

* The mean line and the boundaries calculated using the Shewhart procedure of SAS

Example of data: Series 1 – total fatalities



Results of analyses: changes in trends

Series	Slope of the trend line in the "before" period	Change at the end of 2006	Slope of the trend line in 2007
1. total fatalities	-0.0033 sig.5%	-0.0107 n.s.	-0.0140 n.s.
2. fatalities on rural roads	-0.0043 sig.5%	-0.0104 n.s.	-0.0147 n.s.
3. fatalities on urban roads	-0.0018 n.s.	-0.0109 n.s.	-0.0127 n.s.
4. fatalities in accidents with young drivers	-0.0040 n.s.	-0.0357 n.s.	-0.0398 sig.10%

→ A decreasing trend in the "before" period, strengthened (n.s.) in 2007

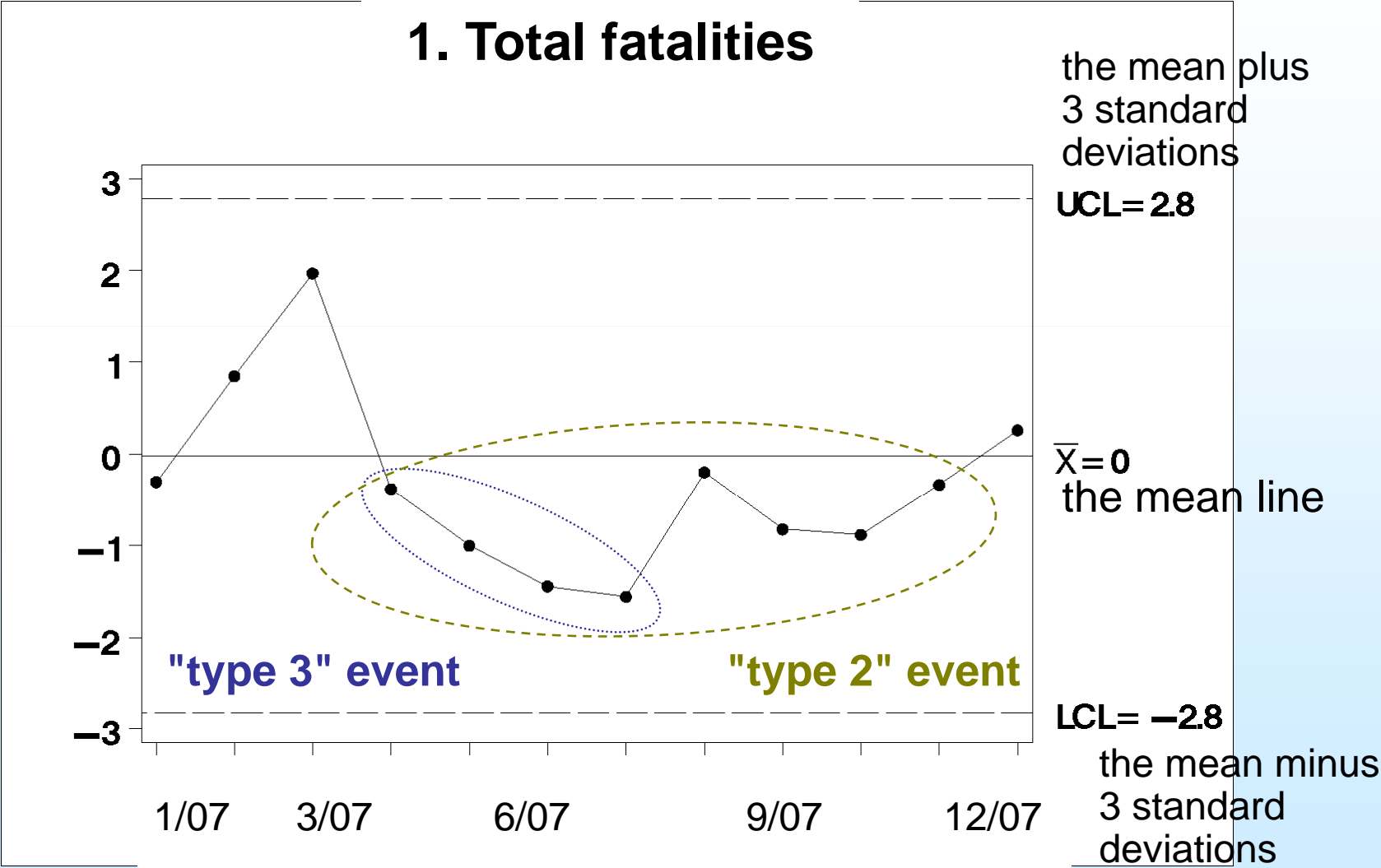
Results: changes in fatality numbers

Series	Average "after"- "before" ratio	95% Confidence interval
1. total fatalities	0.850	0.760 -0.951
2. fatalities on rural roads	0.845	0.712 -1.002*
3. fatalities on urban roads	0.859	0.733 -1.008*
4. fatalities in accidents with young drivers	0.687	0.526 -0.897

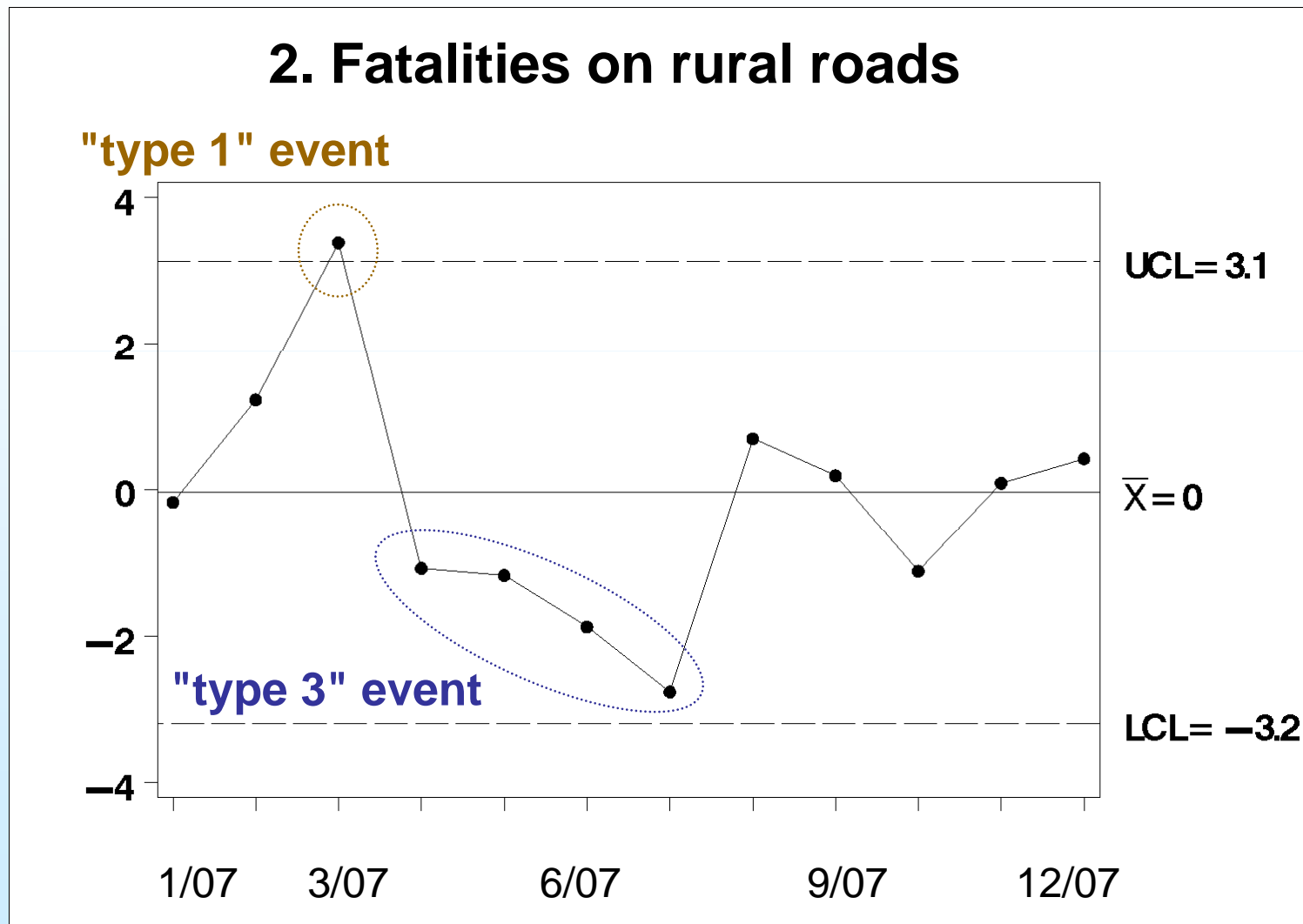
*Sig. at 90% CI

→ A significant reduction in the fatality numbers in 2007 as opposed to the previous years

Results: example of the control charts



Results: example of the control charts



Conclusions

The study revealed:

- **the total number of fatalities** reduced significantly in 2007 as opposed to the previous years - on average, by 15%. A decreasing trend began previously and strengthened (n.s.) in 2007
- **Similar positive changes** in: the numbers of fatalities on rural and urban roads, fatalities in accidents with young drivers, in pedestrian accidents on rural roads and in head-on accidents
- **Signs of negative changes** in: fatalities in single-vehicle accidents, in accidents with professional drivers, in accidents at urban junctions

Conclusions (cont.)

- Applicability of the statistical tools for the examination of changes both in trends and in the numbers of fatalities
- The findings were consistent across different research techniques applied
- The tools provided valid statistical answers concerning the essence and the scope of changes in various types of fatalities
- A potential of on-line monitoring using the control charts

Will the national safety targets be reached?

