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DEALING WITH LACK OF EXPOSURE DATA IN ROAD ACCIDENT ANALYSIS

Dr. John Golias
Associate Professor

Dr. George Yannis
Lecturer

Department of Transportation Planning and Engineering
National Technical University of Athens

THE QUESTIONS

Do we have the data we need?

Do we need the data we have?

Road accident rates can better describe the road accident phenomenon than absolute numbers because they take into consideration the actual traffic patterns (exposure).
Their use implies the combination of accident data with respective traffic data, which presents a number of insufficiencies.

The more the data are useful, the more difficult is to find them

OBJECTIVE

To propose a typology of alternative accident analysis methods in order to deal with existing insufficiencies of exposure data

METHODOLOGY

- International bibliography on road accident analysis techniques.
- Experience from road accident analysis carried out at national and European level, using existing aggregate and disaggregate data on exposure (traffic) and related accidents.
- Particular emphasis is given to the international dimension of the problem as well as to the analysis of disaggregate data.

NUMBER OF PERSONS KILLED PER BILLION VEHICLE-KILOMETERS OF:

(EU 1991 - 1997)

	CARS	BUSES	GOODS VEH.	MOTORCYCLES	MOPEDS
B	17	17	14	**223**	**172**
DK	9	4	5	107	99
D	12	5	0	92	71
GR	29	12	12	**100**	**67**
E	22	**26**	18	**429**	**65**
F	17	**10**	3	144	97
IRL	9	3	5	230	
I	11	5	1	27	35
L	15	2	2	224	25
NL	7	3	4	82	64
A	17	**28**	3	132	99
P	26	**10**	10	**210**	**192**
FIN	7	9	6	18	84
S	7	4	4	59	23
UK	6	9	2	**122**	**28**
EU 15	9	7	4	61	52

INSUFFICIENCIES OF EXPOSURE DATA

- Poor Availability and Reliability of Traffic Data
- Incomparability of Traffic Data
- Inappropriate Disaggregation of Traffic Data

POOR AVAILABILITY AND RELIABILITY OF TRAFFIC DATA

- Not always available and not always reliable.
- Usually estimates based on surveys and counts using a number of assumptions.
- Not always available for all types of traffic; and even if they are, their precision is not the same for all types of traffic.
- The use of new methods demonstrate the insufficiency of the previously used (rectification of previous data).

INCOMPARABILITY OF TRAFFIC DATA

- Serious difficulties at international level due to the existing incomparability of traffic data in the various countries.
- Use of several different traffic estimation methodologies (sample counts, surveys, use of fuel sales, etc.).
- Important differences in the statistical methodology used (calculation of the sample size, etc.) and the frequency of updates.
- Analysis results often present large confidence intervals.

INAPPROPRIATE DISAGGREGATION OF TRAFFIC DATA

- The level of disaggregation of traffic data defines also the level of detail for possible road accident analysis at both national and international level.
- Rather general level of disaggregation of traffic data.
- For certain accident characteristics (use of seat belt and helmet, drinking and driving, respect of speed limits), most often no respective traffic data are available.
- At international level, detailed comparable traffic data are scarcely available.

ACCIDENT ANALYSIS ALTERNATIVES

- Absolute Numbers
- Trends
- Severity Indices
- Induced Exposure
- Percentages Related to Accident Type

ABSOLUTE NUMBERS

- The most basic analysis concerning road accident data.
- The results can be very detailed (multi-dimension Tables).
- In fact, they rather reflect the existing traffic situation than the actual accident risk and their use in road accident analysis should be considered with care.
- The analysis of road accident absolute numbers can only give a general description of the road accident phenomenon.

For the improvement of comparability of accident absolute numbers at international level, special simple or advanced transformation rules are sometimes used.

Number of persons killed in the EU countries (1991-2000)

	B	DK	D	GR	E	F	IRL	I	L	NL	A	P	FIN	S	UK	EU 15
1991	1.873	606	11.300	2.112	8.836	10.483	445	8.083	80	1.281	1.551	3.218	632	745	4.753	55.998
1992	1.671	577	10.631	2.158	7.818	9.900	415	8.014	73	1.253	1.403	3.084	601	759	4.379	52.736
1993	1.660	559	9.949	2.159	6.378	9.867	431	7.163	76	1.235	1.283	2.700	484	632	3.957	48.533
1994	1.692	546	9.814	2.253	5.615	9.019	404	7.091	74	1.298	1.338	2.504	480	589	3.807	46.524
1995	1.449	582	9.454	2.411	5.751	8.891	437	7.020	68	1.334	1.210	2.711	441	572	3.765	46.096
1996	1.356	514	8.758	2.058	5.483	8.541	453	6.676	72	1.180	1.027	2.730	404	537	3.740	43.529
1997	1.364	489	8.549	2.199	5.604	8.444	472	6.712	60	1.163	1.105	2.521	438	541	3.743	43.404
1998	1.500	499	7.792	2.226	5.957	8.918	458	6.837	57	1.066	963	2.425	400	531	3.581	43.210
1999	1.397	514	7.772	2.131	5.738	8.487	417	7.150	58	1.090	1.079	2.231	431	580	3.564	42.639
2000	1.475	527	7.487	2.072	5.510	8.036	415	6.923	67	1.135	1.016	2.201	385	573	3.451	41.274

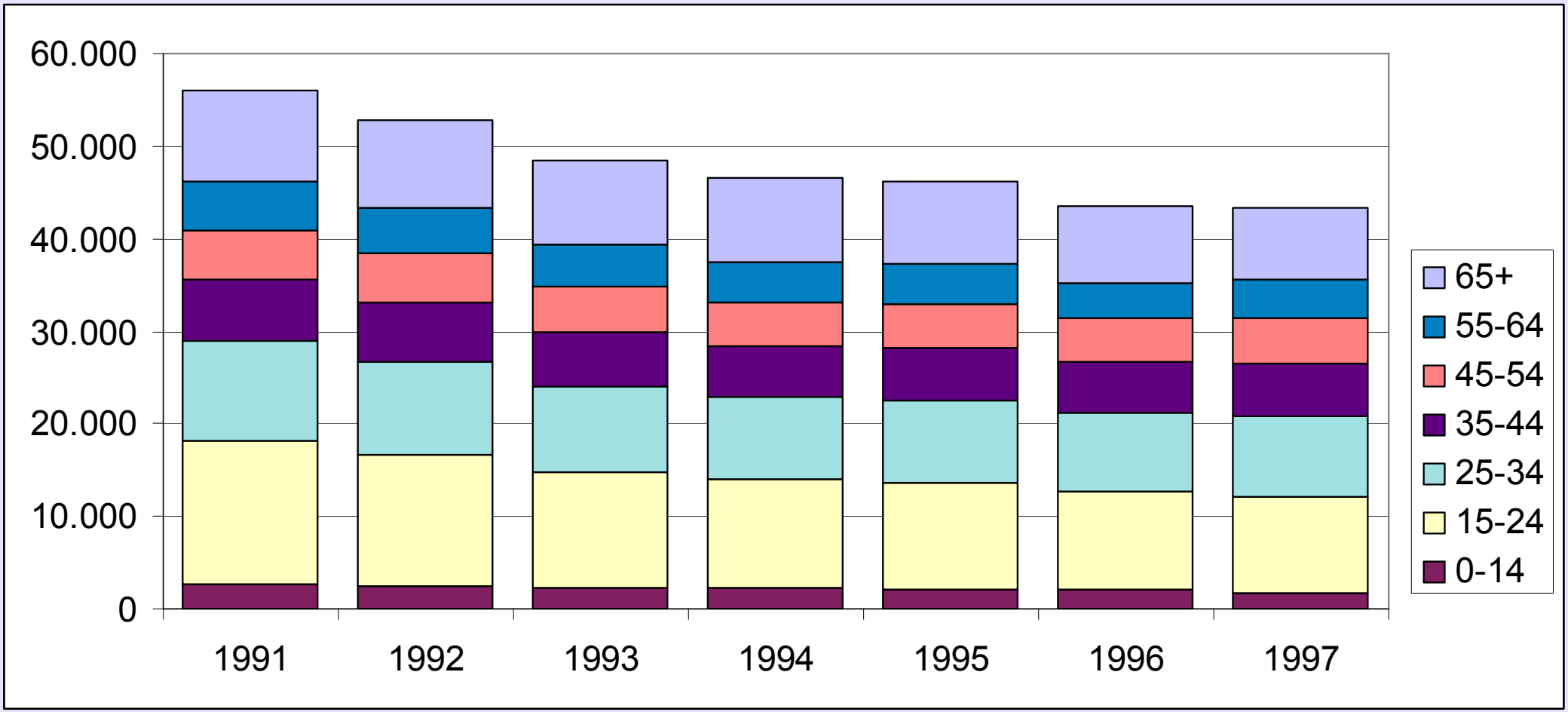
Some figures for 1999 and 2000 are estimations based on the EC Road Safety Quick Indicator

Killed: 30-day period except: GR (1 day up to 1995) +18%, E (24 hours) +30%,
F (6 days) +9% up to 1993 and +5,7% 1994 onwards, I (7 days) +7,8%,
A (24 hours) +12% up to 1991, P (24 hours) +30% up to 1998

TRENDS

- Trends of absolute numbers, percentages, etc.
- Can also be used at any disaggregation level.
- Show the variation over time of the various accident characteristics.
- Provide interesting information about the development of the road safety level.
- Useful in the process of road safety policy planning and evaluation.

Number of persons killed in road accidents in the 15 EU countries by age group (1991-1997)



SEVERITY INDICES

- Traffic data are not necessary as they are contained both in the nominator and the denominator of the ratio (e.g. number of killed persons per injury accidents).
- Interesting results on both aggregate and disaggregate level.
- Incomparability among the national definitions for persons injured could be solved in the future by the introduction of an harmonised definition like e.g. “24-hour hospitalised injured person”.

Ratio of persons killed per 100 persons injured in road accidents, Greece (1985-99)

Accident type	National road	Dept road	Municipal road	Total
Head-on collision	15	**6**	3	**8**
Lateral colission	8	4	1	**3**
Collission at angle	5	4	1	**2**
Rear end collision	5	5	2	**3**
Collission with parked car/fixed object	14	10	7	**9**
Pedestrian involvement	**26**	**16**	6	**9**
Came off the road	9	9	**11**	**9**
Total	10	7	3	**6**

INDUCED EXPOSURE

- Assumption that in every road accident in which two vehicles are involved there is one driver responsible for the accident and one innocent driver involved randomly from the total population of drivers.

- Accident indices are the ratio of the “guilty” drivers percentage with a certain characteristic (age, sex, etc.) divided by the percentage of “innocent” drivers of the same characteristic group.

- It is possible to extract very useful relative accident involvement ratios without using any exposure data and it allows for disaggregate analysis to the level of disaggregation of the existing accident data.

- Concerns only drivers, requires the knowledge of the “guilty” and “innocent” drivers and concerns mainly accidents in which at least two vehicles were involved.

Distribution of alcohol level of drivers Involved in road accidents, Greece (1995)

	< 0,5 g/lt	> 0,5 g/lt	Total
Driver A	916	675	1.591
	58%	42%	100%
Driver B	1421	170	1.591
	89%	11%	100%
Relative Accident Index	0,645	3,971	

PERCENTAGES RELATED TO ACCIDENT TYPE

- Assumption that for a percentage referring to a certain factor in total (e.g. collision type) and for a percentage referring to a certain sub-category of this factor (e.g. head-on collisions) corresponding exposures are equal.

- This method overcomes satisfactorily in certain cases the need for traffic data but it does not provide information concerning actual accident risk.

- These percentages allow for certain comparisons between countries independently of their different exposure figures.

- This method applies only to data related to collision type, accident type, vehicle manoeuvre and person manoeuvre.

Percentages of fatal accidents in three European countries by vehicle type and collision type (1991-93)

	All Collision Types			Single-Vehicle Accidents			Head-On Collisions		
Vehicle Type	NL	IRL	I	NL	IRL	I	NL	IRL	I
Car	**56%**	**56%**	**54%**	**73%**	**65%**	66%	**62%**	**50%**	46%
Lorry	10%	21%	15%	5%	11%	8%	14%	30%	23%
Bus	2%	2%	1%	2%	0%	0%	2%	2%	3%
Two-Wheeled	**12%**	**11%**	19%	**12%**	**19%**	21%	12%	11%	21%
Bicycle	14%	6%	7%	3%	2%	2%	7%	4%	4%
Other	6%	4%	4%	5%	3%	3%	3%	3%	3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

CONCLUSIONS

- The use of absolute numbers and trends of values may lead to conclusions on traffic safety, which are in general of limited significance due to lack of exposure information.

- The use of severity indices overcomes the need for exposure data but corresponding results are obviously limited only to accident severity characteristics.

- The application of the induced exposure method is certainly more useful as it allows the identification of relative risk exposure without the use of data other than those concerning accidents.

- The use of percentages related to certain accident parameters (e.g. accident type) gives useful information without using any traffic data.

CONCLUSIONS

- The proposed methods can be used separately or in combination.

- These methods should be used with great attention and the interpretation of their results should always be considered carefully in an attempt to get the most from existing data.

- Some of the insufficiencies of international exposure data could be eliminated or limited if some actions of progressive data harmonisation took place:
  - uniform road accident data collection form
  - adoption of uniform methodologies for traffic estimations
  - execution of frequent Europe-wide traffic surveys

USEFULNESS AND AVAILABILITY OF DATA