

MACRO-LEVEL EVALUATION OF ROAD SAFETY INTERVENTIONS: AN EVALUATION OF THE ARRIVE ALIVE 1 (1997/1998) ROAD SAFETY CAMPAIGN

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1. INTRODUCTION

700 000 people die annually in road traffic accidents around the world (1) and in the USA road traffic accidents is the fifth top leading cause of death (NCHS website 2000). In South Africa the road traffic accident cost in 1998 (CSIR 1998) amounted to R13,5 billion. Besides the economic burden on the country, road accidents also cause emotional suffering and have social implications.

The purpose of road safety improvement interventions is to reduce of the number and/or severity of road traffic accidents. These interventions are aimed at, for example, changing the road environment to reduce the severity of accidents or changing the vehicle to reduce the number and/or severity of accidents and/or changing the road user behaviour to prevent accidents. Interventions on a macro can therefore include law enforcement, mass media, engineering of the road and/or vehicle etc.

The Organisation for Economic Cooperation and Development (OECD, 1984) lists six basic stages in the historical development of road safety improvement interventions:

- a) the mono-causal casuistic approach that does not consider the interaction of elements in the road system in an accident, leading to the attitude of *blaming the victim*;
- b) the mono-causal accident proneness approach where accident-prone drivers are identified and either kept away from traffic or forced to improve themselves by training and punishment;
- c) the mono-causal chance phenomenon approach that regards accidents purely a matter of chance, i.e. accidents can not be prevented as fate cannot be changed;
- d) the multi-causal chance phenomenon approach where accidents are seen as a result of a combination of factors or the outcome of a chain of events. This combination consists of partly random and partly deterministic factors;

- e) the multi-causal static systems approach that focuses on the nature of the problem through focussed data collection (collecting a *snapshot of the accident*), i.e. failing to consider the dynamic nature of accident processes;
- f) the multi-causal dynamic systems approach is the most recent approach. It attempts to identify critical lines or sequences through all the processes leading to road trauma. This includes road user factors such as urgency, fatigue, use of alcohol and/or drugs and encounters of road users such as experience, skills, motivation, risk-taking, etc.

The most recent approach, the multi-causal dynamic systems approach provides opportunity for the inclusion of the human side of road safety improvement interventions and subsequently, the evaluation thereof.

2. THE NEED TO EVALUATE ROAD SAFETY IMPROVEMENT INTERVENTIONS

The evaluation of road safety improvement interventions is essential to determine whether the intervention had the desired result (AUSTROADS 1988). Evaluation is done to ensure financial accountability and to clarify that the intervention actually resulted in a reduction of accident severity and/or frequency.

In South Africa the expenditure on road transport and road safety has been significantly reduced as a result of limited resources. Evaluation of interventions ensures that funding is directed towards projects that will have the most direct impact on road traffic accidents. The second reason is the need to clarify the accident reductions. Road traffic accident numbers and severity are influenced by numerous factors, e.g. traffic volume changes, changes in population, etc. There may also be other effects that can merely cause a shift in the presentation of accidents like the risk homeostasis process (Wilde 1994).

3. EVALUATING ROAD SAFETY INTERVENTIONS

Traditionally, evaluation of road safety interventions is done by using qualitative measures, i.e. accident data, wearing of seatbelts etc. The study proposes that an additional group of indicators be utilised, namely, qualitative indicators.

Accident data measured during a campaign is one of the short-term measures for a road safety campaign. The purpose of a campaign is however also targeted at achieving longer-term effects such as changing perceptions, attitudes and ultimately safer road user behaviour. The use of

qualitative indicators will enable the funding organisation or the organising team of the safety campaign to measure the approach, short-term and longer term effects using human behavioural science principles.

The evaluation of road safety improvement interventions includes qualitative and quantitative indicators. Qualitative indicators include the analysis and evaluation of accident data and quantitative indicators includes the evaluation of the human factor in terms of behaviour, attitudes, perceptions etc.

4. AN INTRODUCTION TO QUALITATIVE EVALUATION INDICATORS

The analysis of accident history is a qualitative evaluation indicator for road safety improvement interventions. For road safety campaigns, the following should be considered when using accident history to evaluate effects of a campaign:

- accident reporting criteria can differ between countries (South Africa for instance defines a fatality as a death within seven days of the accidents and other countries deaths up to thirty days)
- coding effects can influence accident data, for example, the accident report form can change as it did recently in South Africa
- data can be bias – alcohol involvement in accidents can be reported as low due to difficulty in measuring the blood alcohol content in the blood (legislation in South Africa required, until recently, that a blood sample be taken by a district surgeon)
- random fluctuations can occur in accident data.

Accident history can be evaluated by using:

- accident frequency;
- accident severity;
- accident rates;
- accident costs
- trends
- accident types
- risk indices.

4.1 Accident frequency

The effectiveness of a campaign is often determined by measuring the number of accidents and/or fatalities. This, however, fails to take exposure into account. This can change the result of the analysis significantly.

4.2 Accident rates

Three types of accident rates can be calculated:

- basic accident rates;
- population-based rates;
- exposure-based.

Population-based accident rates express accident fatalities, numbers and/or injuries in terms of the area population (number of people living in a particular area), the vehicle population etc. ITE (1990) states that population-based rates provide a measure for public health to allow for the evaluation of target groups for public health funding.

Exposure-based accident rates expresses the accident number and/or severity in terms of unit travel, kiloliters fuel or per length of road in the road system (ITE 1992). It provides a measure of the risk exposure in the transportation system.

Figure 1 shows the difference between the number of fatalities and the fatality rate per 1000 registered vehicles in South Africa.

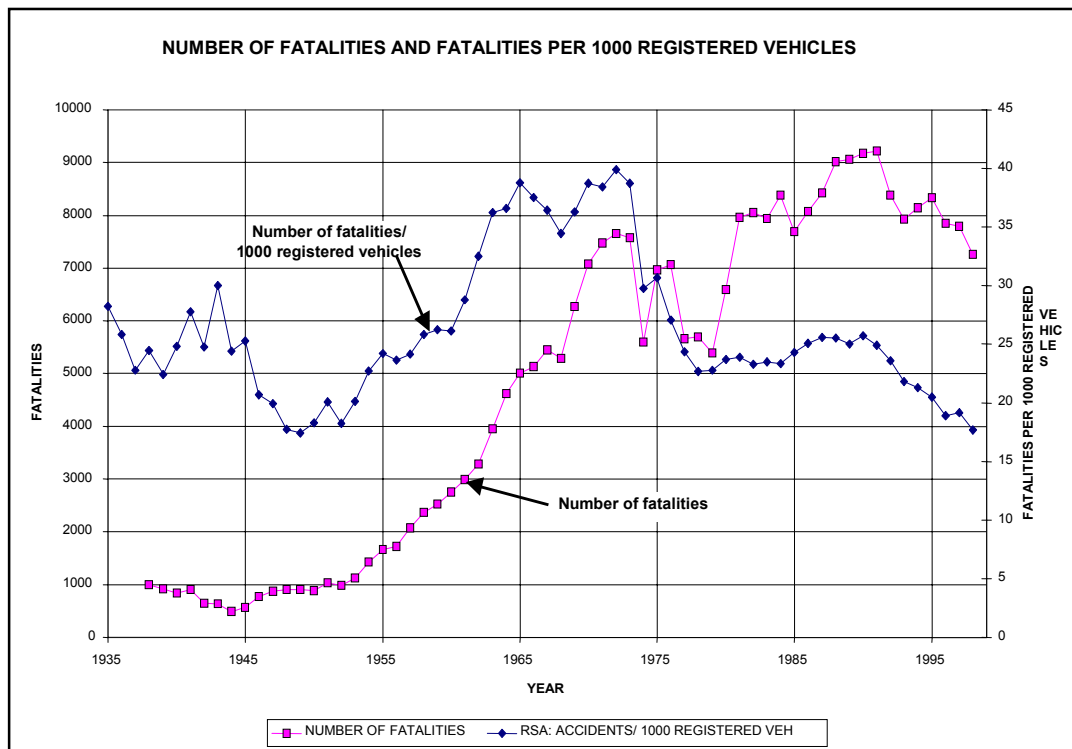


Figure 1: Number of fatalities and the fatality rate per 1000 registered vehicles for South Africa (after CSS 1999) using annual accident data

4.3 Accident costs

ITE (1992) describes accident cost as a measure that takes the severity and related cost into account. The emphasis on fatal accidents may be too high (in some cases fatal accidents may be significantly lower than other degrees of accidents) and therefore distort the representation of data. They recommend a combination of the number of fatality and injury accidents to calculate an average fatal-plus-injury average accident cost. They also recommend that accident costs as a measure only be used to compare alternative remedial measures.

4.4 Accident trends

Accident data contains two components. The first is a portion that is related to external factors like the economy, vehicle population, population, etc. that show time related changes (i.e. trends). The second is the portion that describes the randomness of accident occurrence. The second is a random fluctuation around the first. It is difficult to identify the deterministic element of the accident data as a large number of variables can influence accidents. Frith and Toornath (1982), Pant *et al* (1992) and Hakim (1991) list a number of variables that can influence accidents and their outcomes:

- vehicle composition and traffic volumes;
- driving behaviour and changes in the driver population;

- violence and aggression;
- vehicle inspections;
- vehicle safety improvements;
- motorcycle crash helmets;
- improved roads;
- traffic management;
- vehicle occupancy;
- season (holiday), recreational and tourism travel;
- climate (especially wet weather);
- light conditions (number of daylight hours);
- socio-economic factors;
- economic factors and changes in fuel prices;
- legislation;
- driving under the influence of alcohol and drugs;
- use of seatbelts;
- traffic volumes.

ITE (1992) reports that the analysis of long-term trends of accident data from the National Safety Council in the USA proved that accident fatalities reflect economic, population and vehicle population growth. They explain the trends with one of three theories:

- road users became more *roadwise* as motorization improves and therefore fatalities reduce;
- public demand for a safer road system increases as motorization improves. The road safety professionals then implement safety measures that reduce fatalities;
- economic recessions, legislation based on safety, road building projects and other discrete events contribute to cause a long-term fatality reduction.

Carter and Hombruger (ITE 1982) note that seasonal effects are also typical of accident data and that the summer travel peak is associated with an increase in accidents.

4.5 Accident type

Accident types can be represented per accident type. It allows for more detailed analysis of accident patterns. In the case of road safety campaigns, some of the accident types (e.g. head-on, etc.) can indicate whether changes in risk or shifts in risk took place.

4.6 Risk Indices

A risk index can be calculated for age or sex groups of those killed, injured or involved in road traffic accidents (ITE 1990). It can be computed using the following equation:

$$RI = \frac{\% \text{ Accident involvement in group}}{\% \text{ Population in group}} \dots\dots\dots \text{Equation 1}$$

This method however, does not take the exposure of the particular age group into account.

4.7 Statistical accident analysis

The portion of change in accident numbers or rates during the campaign is often the primary measure used to determine the short-term success of a road safety improvement intervention. The methods in section 4.1 to 4.6 compares data over time periods but provides no indication of the significance of change.

Statistical significance

An accident data series consists of two elements, namely, the deterministic and the random elements. The random element of accident data follows a Poisson distribution. The distribution can be described by a discrete random variable that takes on integer values. If the sample size of a Poisson distribution is greater than 1000, then it can be approximated by the normal distribution. For a normal distribution, the standard deviation of a series is the square root of the value. For a 95% confidence interval, changes within two standard deviations from the mean can be attributed to random fluctuations. For example, an analysis of the number of accidents per year in South Africa will be as follows: during 1998 a total number of 511 605 accidents were recorded in South Africa. The standard deviation is thus the square of 511 605, 715,3 accidents. This means that a change of 1431 (two standard deviations) can be attributed to random fluctuations. In the case of fatalities, a total number of say, 8000 fatalities, two standard deviations is 2.2% of the total of 8000 fatalities. A change $\pm 2,2\%$ can thus be attributed to random fluctuations. This can have a significant effect on the significance of changes in accident data during and after campaigns.

Predicting accident data

Accident data is a time series. Complex time series is characterised by *having memory*, i.e. it is influenced by other events in the series. Although accidents are random events, certain external factors that influence accident occurrence are not random and have a trend. ARIMA refers to the autoregressive moving average model which is a model that can identify a trend and quantify the random fluctuations around the trend line. The parameters of the ARIMA model are estimated from

the available data for the stationary time series. It is normally done using special routines in a computerised analysis.

5. DETERMINING QUALITATIVE EVALUATION INDICATORS

5.1 Yearly data

Annual accident data for South Africa is available from 1935. The purpose of this section is to illustrate the different types of accident analysis utilising national annual accident data.

Accident frequency

The total number of accidents and fatalities are shown in Figure 2.

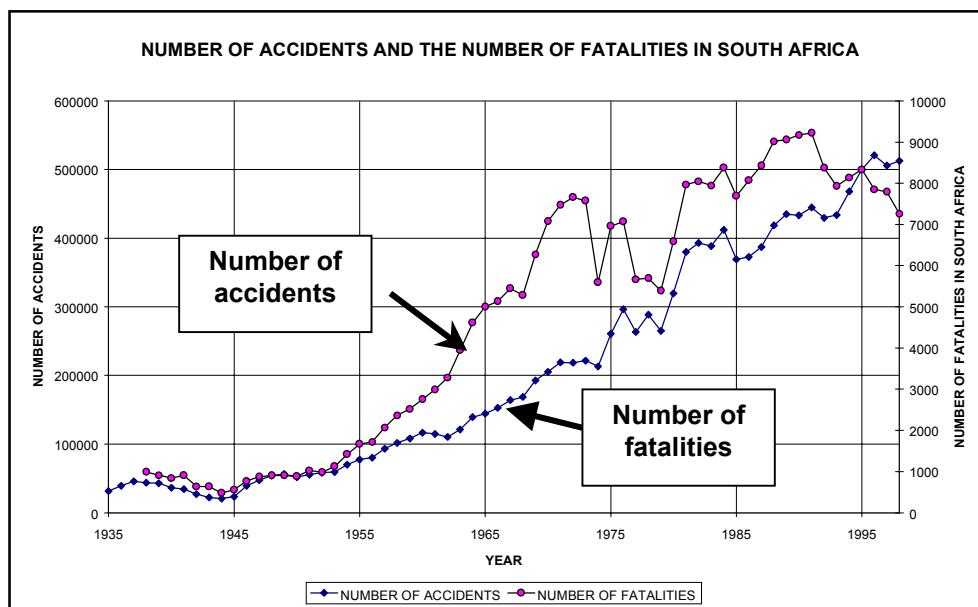


Figure 2: The number of accidents and fatalities in South Africa (after CSS 1999).

Accidents increased by 4,1% from 1995 to 1996, decreased by 2,8% from 1996 to 1997 and increased again by 1,3% from 1997 to 1998. Fatalities increased slower than the total number of accidents from 1935 to 1973. From 1960 the increase and decrease of the number of accidents corresponded with increases and decreases in the number of fatalities.

Figure 3 shows the fatalities and accidents per million area population for South Africa. The increase and decrease in the fatality rate per million area population corresponded with increases and decreases in the number of accidents per million population.

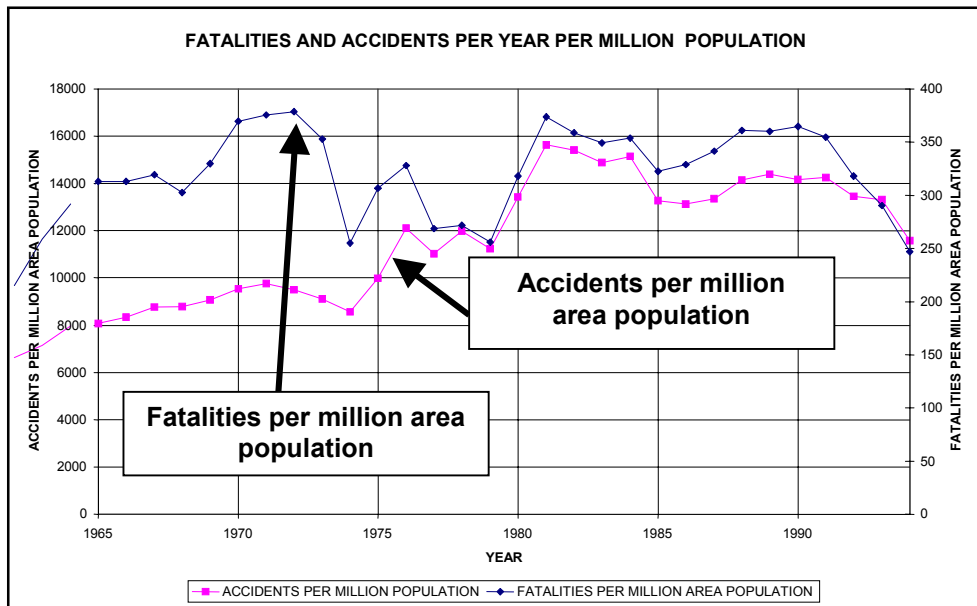


Figure 3: Fatalities and accidents as a rate per million area population (South Africa) (after CSS 1999)

Figure 4 shows the fatalities and accidents per 1000 registered vehicle population. The fatality rate per 1000 registered vehicles reduced from 1996 to 1998. A regression analysis was prepared for these two series. The residuals were however not acceptable (refer to Appendix A). This can be explained by the fact that the number of registered vehicles is not an indication of the exposure to accident risk.

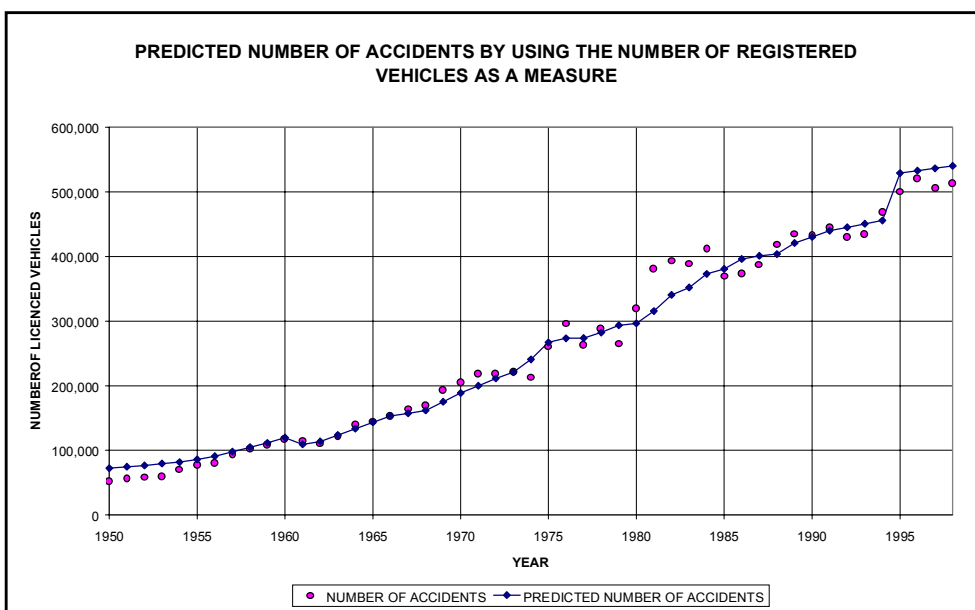


Figure 4: The predicted number of accidents based on the number of registered vehicle population

Figure 5 shows the plot of number of accidents related to the total fuel (petrol and diesel¹) sales from 1950.

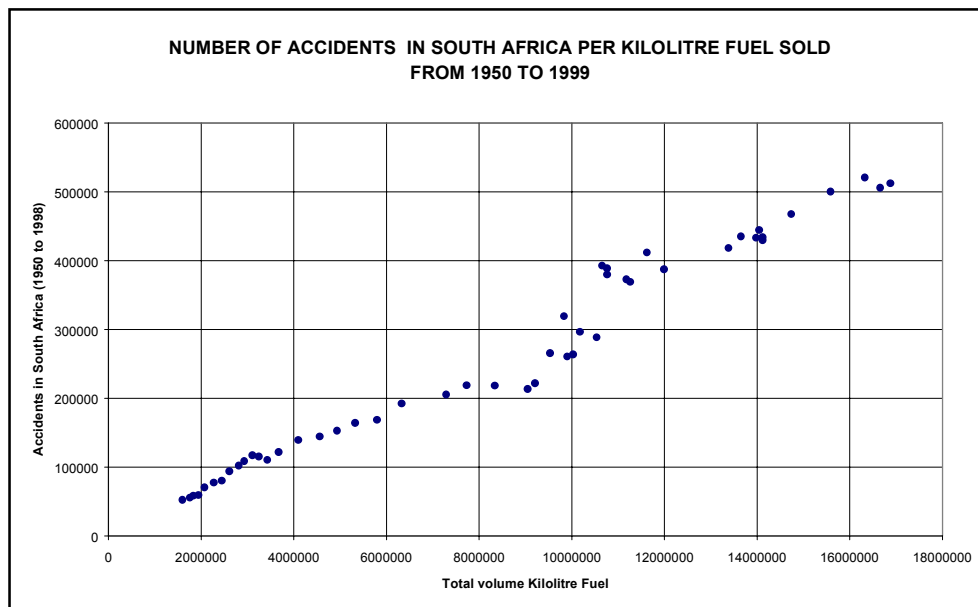


Figure 5 : The number of accidents and the fuel (petrol and diesel) sales in South Africa from 1950 to 1998 (Department of Mineral and Energy Affairs, 2000 and data from CSS).

Note that the data between 1970 and 1986 shows great variation. This can be explained by the fuel that the National Defence Force bought for the Angola war. If the data between 1970 and 1986 are disregarded, a regression line can be fitted as shown in Appendix B. The regression line however does not intercept at the origin. This means that the estimation implies that accidents still occur even if fuel sales are zero. This can be explained by the fact that the petrol and diesel prices do not provide information or relationships that include the different transportation modes, their vehicle kilometres or fuel efficiency. The use of monthly data is even more problematic as fuel sales and usage do not necessarily takes place during a calender month.

Figure 6 shows the degree of injuries in South Africa from 1938. The degree of injury can be defined as the percentage Fatal and Serious Degree injury accidents per total number of accidents. Serious injury accidents are included as the difference between a fatality and a serious injury is merely a function of the health of the particular patient and the health or after-care system available. During the past few years the degree of injury of accidents reduced. This can be as a result of the use of seatbelts, safer car technologies etc.

¹ The categories of petrol and diesel sales are only available for the period 1 January 1995 to date. Previous information is only grouped into total sales of petrol and diesel. Vehicle kilometres per mode are not available and can therefore not be utilised.

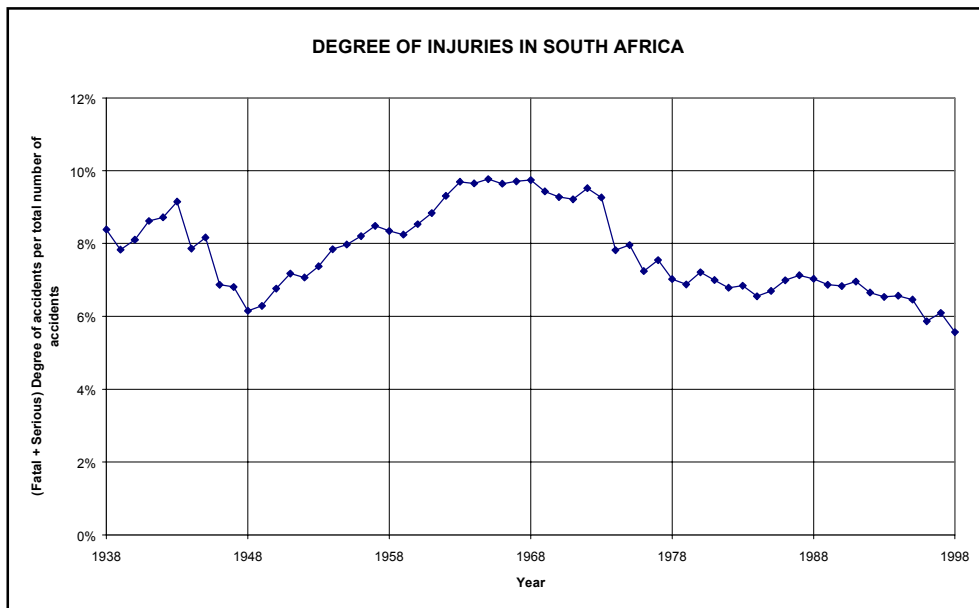


Figure 6: The degree of injuries in South Africa.

5.2 Monthly data

Data analysis

The study investigated the monthly time series of the following areas:

- South Africa
- KwaZulu-Natal
- Gauteng
- Western Cape
- Durban Metropolitan area.

The data selected included:

- Total number of accidents
- Number of accidents per accident type
- Per accident type:
 - Number of accidents
 - Number of fatalities
 - Degree of injuries
 - Number of accidents per kiloliter fuel
 - % accidents on weekdays, Saturdays and Sundays
 - % accidents during twilight, daytime and night-time visibility conditions
 - % accidents during AM, PM and off-peak periods.

Normalised data graphs were prepared for each of the different areas indicating the particular data set. The data series were normalised by determining the average value of the data series from 1 January 1994 to the end 1998, then the standard deviation of the series and then plotting the series as a function of the average value and the standard deviation (equation 2).

$$\text{Plotted value} = \frac{\text{Value} - \text{Average Value}}{\text{Standard Deviation}} \dots\dots\dots \text{Equation 3}$$

The monthly average values for the months of October, November, December and January of each year (Arrive Alive 1 took place from 1 October 1997 to 31 January 1998) were also calculated.

An example of such a plot is shown in Figure 7.

Findings

The plotted data for the total number of accidents and total number of fatalities showed large fluctuations around the mean but still within two standard deviation of the mean. Assessment of the monthly average accident data over the comparative periods in 1994/95, 1995/96 and 1996/97 also indicated fluctuations around the mean within two standard deviations. The same was found for the different accident types.

The plotted data as a function of the fuel sales² for the different areas over the period 1 January 1994 to 31 December 1998. The series showed large fluctuations around the mean but still within two standard deviations from the mean. The same was true for the monthly average accident numbers over the comparative October to January periods. The same phenomenon was found in the other data sets that included:

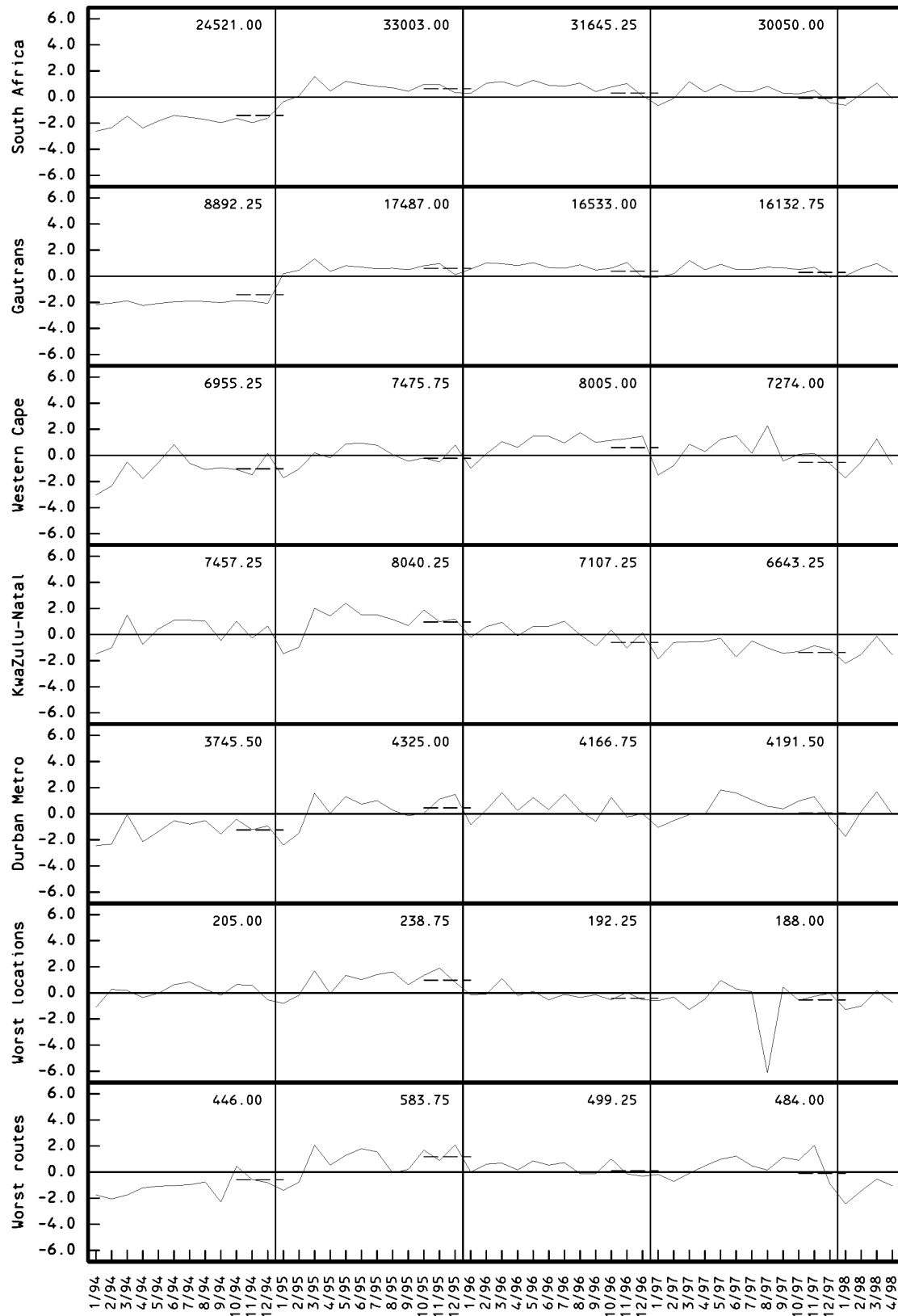
- Degree of injury
- Driver ages per vehicle type
- Day of week
- Visibility conditions
- Time of day
- Accident types.

² In this case it was possible to differentiate between petrol and diesel sales and to exclude fuel sales to, for example, sea fisheries etc. that was not utilised on the road network.

ARIMA analyses were carried out for the total number of accidents in South Africa and the total number of accidents in the Durban area. The analyses were performed using the SAS program and the data analysis was done by the University of Pretoria. Both data series showed a non-stationary character and AR(1) models were fitted to both series up to September 1997 (Arrive Alive 1 started 1 October 1997). The models were able to make predictions but all the predictions were within the two standard deviations around the mean and longer term predictions tended to move to values closer to the mean, indicating the poor prediction value of the models.

A selection of worst locations and worst routes were also made in the Durban Metropolitan area. In some cases the fluctuations of the graphs coincided with those observed in the metropolitan, provincial and national data. The small sample size in some categories of data series made the use of these results invalid.

It can therefore be concluded that the statistical analysis of macro-level accident data for South Africa, Gauteng, KwaZulu-Natal, Western Cape and the Durban Metropolitan area and selections of intersections and routes in the Durban Metropolitan area proved to be statistically non-significant. The use of alternative evaluation elements for road safety improvement interventions on a macro level is therefore necessary.



Graph C.1: Total: Total number of acc

Figure 7: Normalised data for the total number of accidents in the various areas (Van Schalkwyk, 2000)

6. QUALITATIVE MEASURES: CONSIDERING THE HUMAN FACTOR

Glendon and McKenna (1995) found that long-term positive changes in road traffic safety can only be secured by change in attitude and behaviour. Attitude change is a necessary but not sufficient condition for behaviour change.

An in-depth literature study was made of the following human behavioural concepts:

- behaviour;
- behaviour modification;
- motivation;
- attitude – characteristics, levels, functions, attitude change;
- risk – the relationship with behaviour, estimation, the media, risk homeostasis;
- law enforcement;
- skills;
- beliefs;
- various approaches to road safety improvement interventions;
- the interaction between behaviour, motivation, attitude, perceptions and risk.

The study identified a number of criteria and evaluation elements based on these psychology components. These criteria and evaluation elements can be placed in two categories, namely input related and outcome related issues. The input related category refers to the criteria and evaluation for the media, communication and other aspects that were presented to the public. The outcome related category refers to the criteria and evaluation of the public.

7. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions were made based on the study:

- road traffic accidents place a burden on South Africa in terms of cost and emotional hardship;
- South Africa is implementing various measures and programs aimed at improving road traffic safety (e.g. the Road Traffic Management Strategy, Arrive Alive 1, etc.);
- there is a need to identify key performance indicators that can be used to evaluate road safety improvement interventions to ensure that the intervention is economically viable;
- the macro-level evaluation of accident data with statistical methods to determine the significance of change during and after an intervention is problematic as the data shows no particular trends, only random fluctuations around the mean – a lack of measure for exposure makes the use of trend analysis to predict the expected number of accidents without the

intervention impossible as even the use of fuel sales as a measure of exposure is not accurate enough;

- there is a need for the development of an indicator of exposure with a higher degree of correlation than fuel sales that can be used to express accident data in terms of exposure;
- the human factor is an essential element of road safety improvement interventions. The mechanisms of attitude, behaviour, motivation, risk and skills should be incorporated in the planning and evaluation of road traffic safety improvement interventions;
- input-based and output-based criteria for the human factor in road traffic safety interventions provide qualitative key indicators for the evaluation of these interventions.

Based on the study, it was recommended that:

- a model or measure be developed that can be utilised to predict accident trends and volumes – exposure need to be an essential part of this model;
- the human factor be considered in the development and evaluation of road traffic safety improvement interventions;
- independent experts with knowledge of human behaviour independent funding be contracted to evaluate all steps and measures that were introduced to address road safety and to evaluate road safety interventions like Arrive Alive 1.

8. REFERENCES

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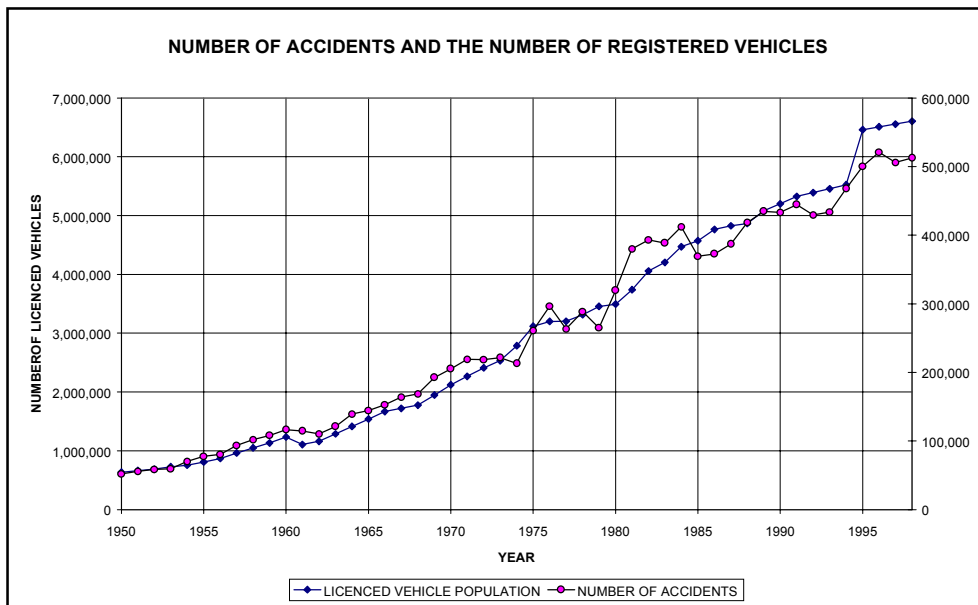
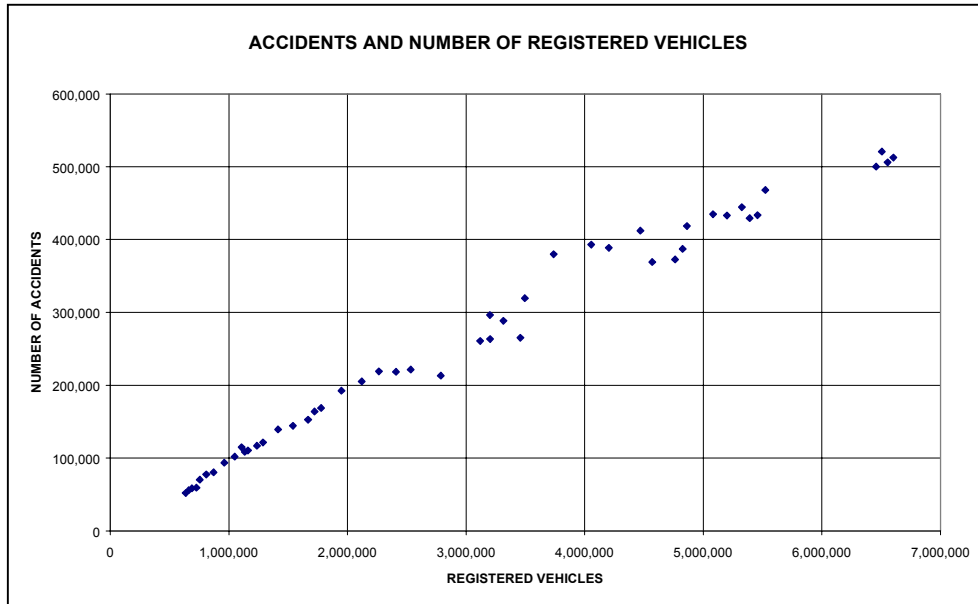
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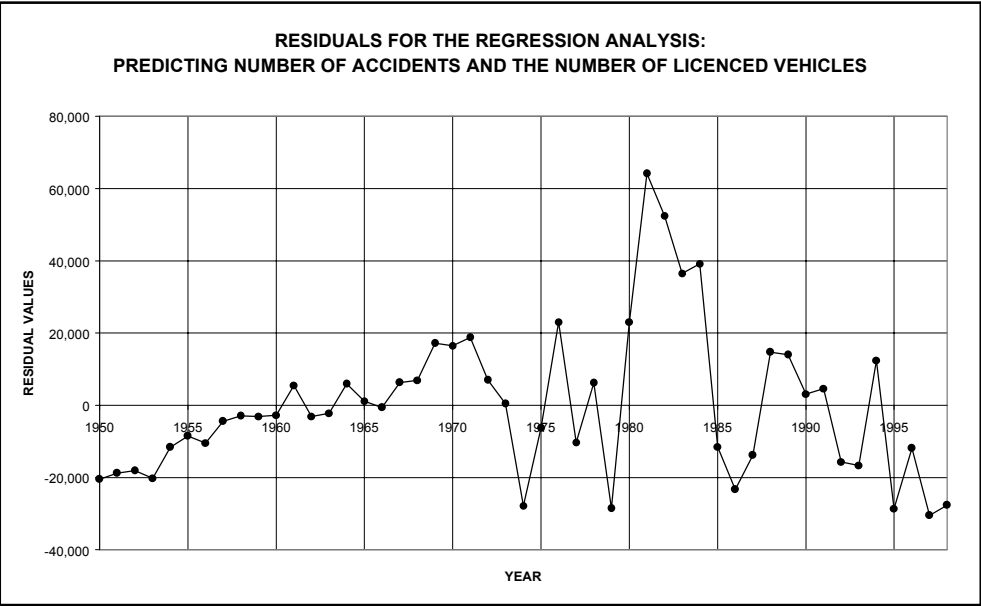
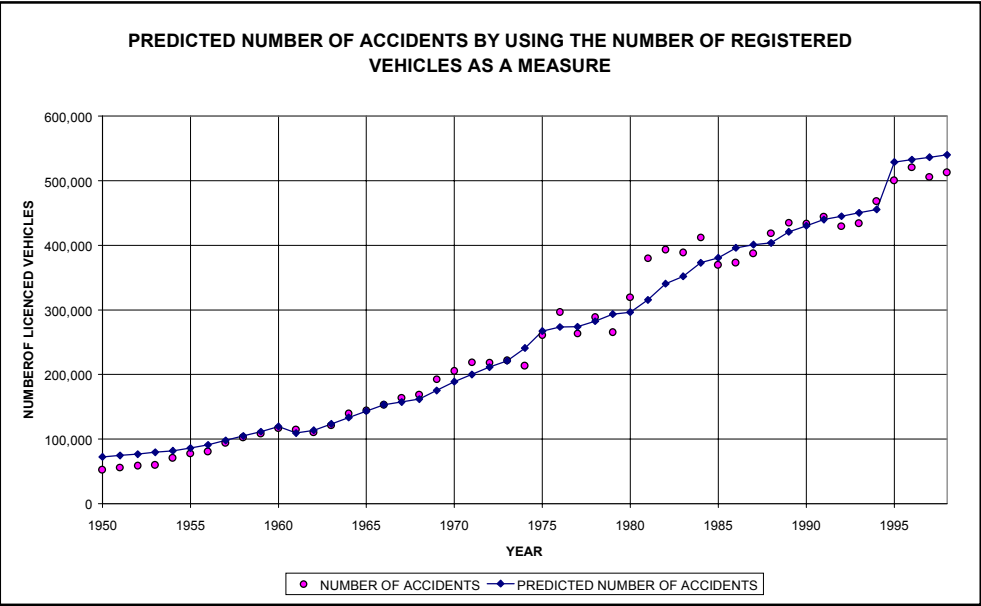
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APPENDIX A:

THE REGRESSION ANALYSIS FOR NUMBER OF ACCIDENTS AND NUMBER OF REGISTERED VEHICLES (Van Schalkwyk 2000)





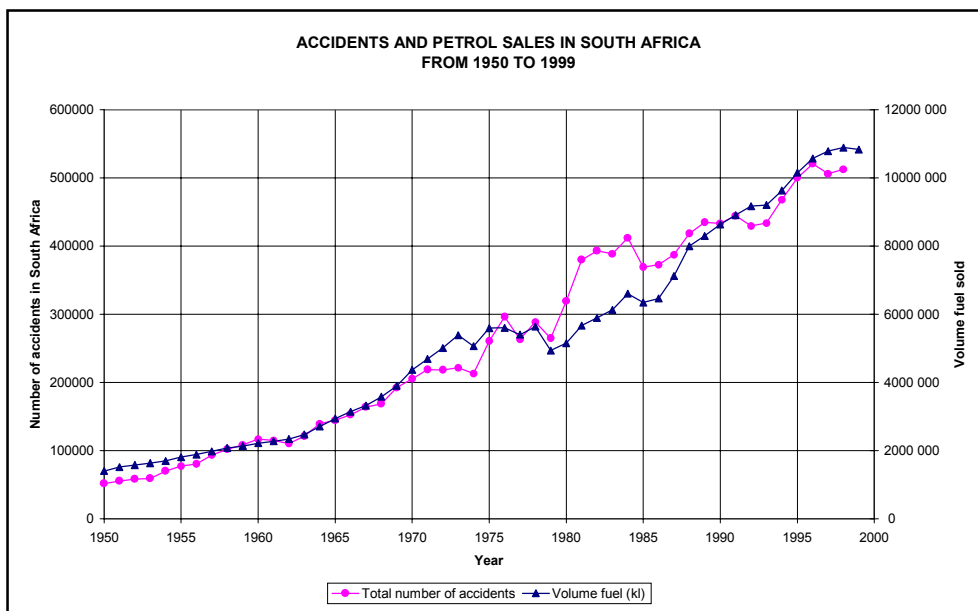
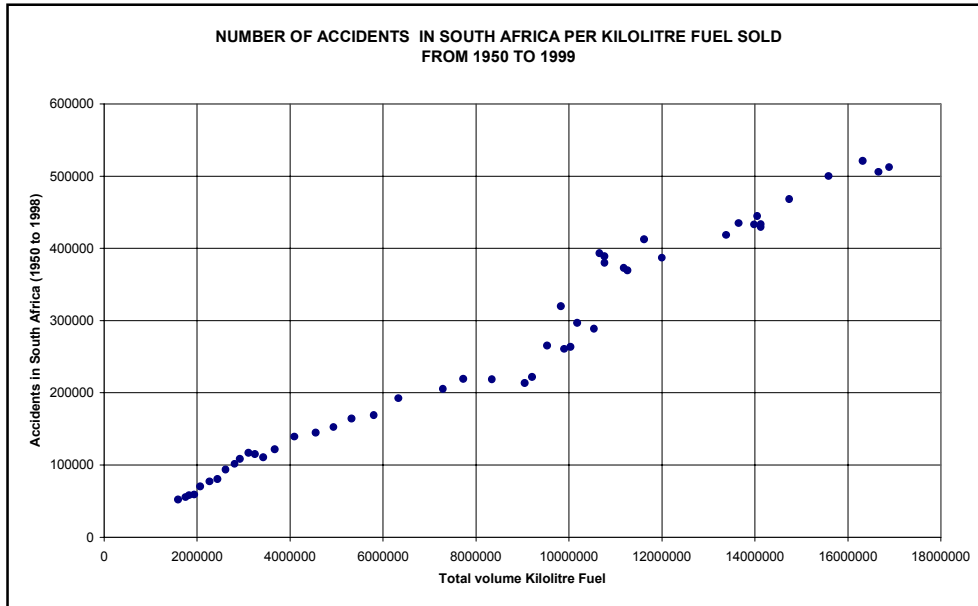
SUMMARY OUTPUT

<i>Rearession Statistics</i>	
Multiple R	0.99
R Square	0.98
Adjusted R	0.98
Standard Error	20739.06
Observations	49.00

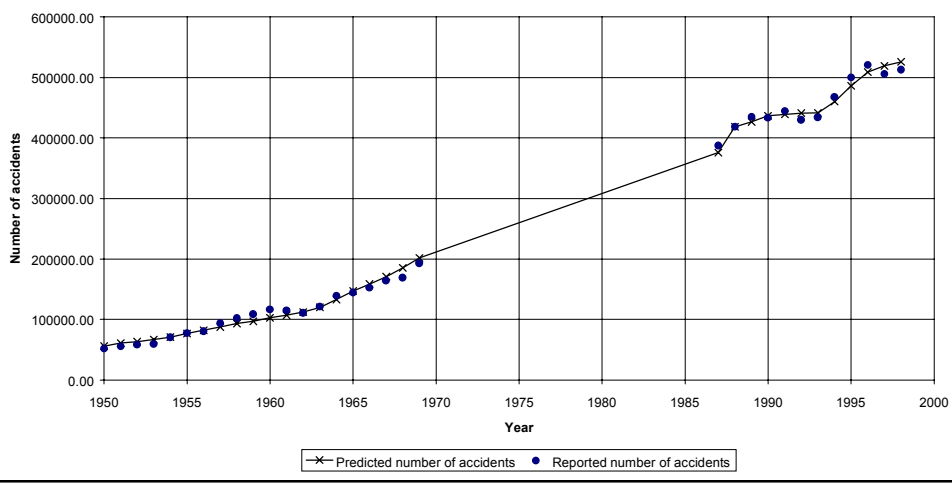
RESIDUAL OUTPUT

<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>
1.00	72390.99	-20424.99
2.00	74391.70	-18758.70
3.00	76503.11	-18060.11
4.00	79529.74	-20209.74
5.00	81756.94	-11575.94
6.00	85961.96	-8482.96
7.00	90732.77	-10469.77
8.00	97890.09	-4390.09
9.00	104763.70	-2868.70
10.00	111411.28	-3090.28
11.00	119451.43	-2763.43
12.00	109281.76	5507.24
13.00	113559.22	-3077.22
14.00	123488.72	-2192.72
15.00	133418.23	5982.77
16.00	143347.73	1149.27
17.00	153277.24	-594.24
18.00	157544.86	6330.14
19.00	161812.48	6903.52
20.00	175309.51	17205.49
21.00	188806.55	16460.45
22.00	200103.35	18822.65
23.00	211400.15	7035.85
24.00	221061.81	466.19
25.00	240952.65	-27849.65
26.00	267021.94	-6259.94
27.00	273514.60	23050.40
28.00	273680.18	-10315.18
29.00	282420.98	6217.02
30.00	293572.82	-28473.82
31.00	296487.49	23019.51
32.00	315652.53	64199.47
33.00	340477.41	52493.59
34.00	352086.94	36512.06
35.00	372946.70	39150.30
36.00	380747.19	-11562.19
37.00	395933.70	-23265.70
38.00	400950.68	-13802.68
39.00	403754.42	14728.58
40.00	420887.39	14047.61
41.00	430187.40	3099.60
42.00	439955.44	4585.56
43.00	445172.18	-15687.18
44.00	450388.93	-16677.93
45.00	455605.67	12391.33
46.00	528839.98	-28606.98
47.00	532630.90	-11856.90
48.00	536421.83	-30433.83
49.00	540212.75	-27607.75

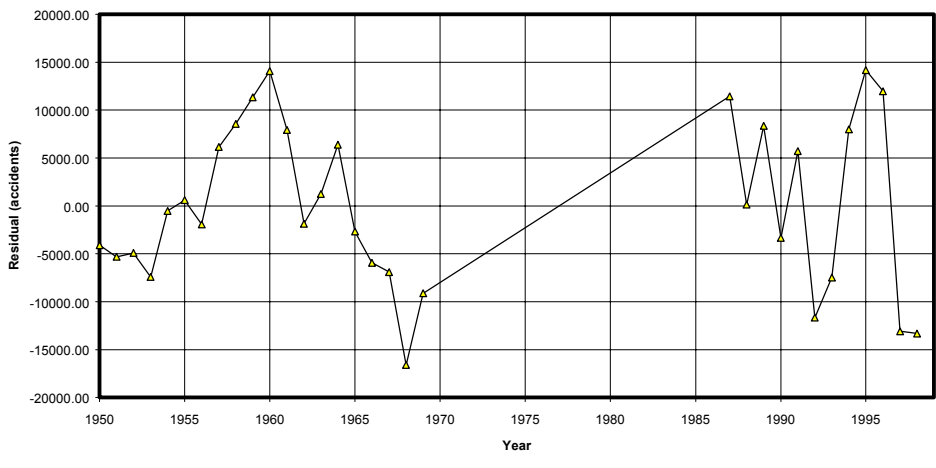
APPENDIX B: THE REGRESSION ANALYSIS FOR NUMBER OF ACCIDENTS AND FUEL (PETROL AND DIESEL) SALES (Van Schalkwyk 2000)



**PREDICTED CURVE:
 LINEAR REGRESSION OF NUMBER OF ACCIDENTS AND VOLUME FUEL SALES
 (1950 TO 1999 - EXCLUDING 1970 TO 1986)**



**RESIDUALS FOR THE LINEAR REGRESSION ANALYSIS OF
 THE NUMBER OF ACCIDENTS AND THE VOLUME FUEL SALES
 (1950 TO 1999 - EXCLUDING DATA FROM 1970 TO 1986)**



Output of the regression analysis of the number of accidents and the volume fuel sales from 1950 to 1999 with the exclusion of datapoints between 1970 and 1986.

<i>Regression Statistics</i>	
Multiple R	1.00
R Square	0.99759397
Adjusted R Square	1.00
Standard Error	8788.61
Observations	32.00

RESIDUAL OUTPUT

<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>	<i>Standard Residuals</i>
1.00	56067.52	-4101.52	-0.47
2.00	60954.75	-5321.75	-0.62
3.00	63352.25	-4909.25	-0.57
4.00	66733.36	-7413.36	-0.86
5.00	70698.47	-517.47	-0.06
6.00	76876.66	602.34	0.07
7.00	82194.21	-1931.21	-0.22
8.00	87358.08	6141.92	0.71
9.00	93321.11	8573.89	0.99
10.00	96978.85	11342.15	1.31
11.00	102603.77	14084.23	1.63
12.00	106876.25	7912.75	0.92
13.00	112347.49	-1865.49	-0.22
14.00	120031.81	1264.19	0.15
15.00	133002.95	6398.05	0.74
16.00	147172.84	-2675.84	-0.31
17.00	158607.11	-5924.11	-0.69
18.00	170779.08	-6904.08	-0.80
19.00	185317.81	-16601.81	-1.92
20.00	201639.31	-9124.31	-1.06
21.00	375704.57	11443.43	1.32
22.00	418337.19	145.81	0.02
23.00	426574.79	8360.21	0.97
24.00	436625.88	-3338.88	-0.39
25.00	438808.23	5732.77	0.66
26.00	441144.26	-11659.26	-1.35
27.00	441175.00	-7464.00	-0.86
28.00	460016.95	7980.05	0.92
29.00	486051.44	14181.56	1.64
30.00	508797.03	11976.97	1.39
31.00	519063.28	-13075.28	-1.51
32.00	525917.70	-13312.70	-1.54

MACRO-LEVEL EVALUATION OF ROAD SAFETY INTERVENTIONS: AN EVALUATION OF THE ARRIVE ALIVE 1 (1997/1998) ROAD SAFETY CAMPAIGN

Ida van Schalkwyk

B.Eng (Hons) Transportation, SAICE

Present position : Lecturer
Department of Civil and Urban Engineering,
Rand Afrikaans University



Principal fields of expertise

Ida van Schalkwyk has specialised in the field of traffic engineering, with specific reference to road traffic safety. This includes transport studies and traffic engineering projects like traffic impact studies, traffic calming, road traffic safety studies, access management, road signs and markings, traffic signals and control, interim transport plans, traffic accommodation during construction and contract documents for traffic related projects.

Significant projects

The South African Road Safety Manual (SARSM) The SARSM is a best-practice guideline document on road safety engineering prepared under COLTO and funded by National Department of Transport. The project is ongoing and the document to date (Final Draft Stage) consist of the following documents (Ida are involved in Volumes 1 to 6):

Volume 1: Principles, policies and procedures; Volume 2: Road safety engineering assessment on rural roads; Volume 3: Road safety engineering assessment on urban roads; Volume 4: Road safety audits; Volume 5: Remedial measures and evaluation; Volume 6: Roadside hazard management and Volume 7: Design for safety.

Access management projects Ida was involved in a number of access management policy documents and plans. This included:

- Policy document for the management and control of access to the Centurion street system
- The management and control of access to the Pretoria street system
- The management and control of access to the Midrand street system
- Access management plans in Pretoria (Rachel de Beer Street, Zambesi Street, Middel Street (Project leader), Lynnwood Road) and Centurion (Gerhard Street, Cantonments Road, Jean Avenue, Botha Avenue, Lyttleton Road, Saxby Road, Hendrik Verwoerd Road, Rabie Street, Station Road, Cradock Avenue, Willem Botha Street, Centurion)

Road safety projects She was involved in a number of road safety projects that included:

- The road safety programme for the Katsheong-Thokoza-Vosloorus Area, Gauteng – This project involved the evaluation of hazardous locations identified by the local communities, organisations, teachers and taxi organisations in the area
- Pietersburg traffic database information system – The evaluation of a number of hazardous locations and the identification of remedial measures
- The preparation of a road safety management plan for the Greater Pretoria Metropolitan Council
- Midrand road safety project – This project involved holding meetings with the SAPS, the City Engineers Department and the Traffic Law Enforcement Section of Midrand Town Council. Accident data (the gathering, quality and interpretation thereof), hazardous location investigations and road safety audits formed an integral part of the project.
- Potgieter Street Traffic Safety Project, Pretoria (project leader)
- Investigation of a number of hazardous locations and the identification of remedial measures

Courses, lectures and radio interviews She has presented various lectures and presentations at a number of courses, seminars and workshops and participated in a number of radio interviews. The topics included: The road environment and safety, Safety at roadworks, Roadside hazard management, Remedial measures, The SARSM, The Municipal Engineer and Road Traffic Safety, Traffic calming, Road rage, General traffic safety. She recently presented a road safety audit workshop to the Swaziland Government.

Other

- Steering committee member and convenor for the road traffic management and safety sessions of the South African Transport Conference (SATC) – From 1997 to date
- Transportation Division Committee member, SAICE – 1999, 2000.