Speed Humps Have No Significant Effect on Road Traffic Accidents

An Analysis of the Impact of Speed Humps as a Traffic Calming Device in Chislehurst, London.

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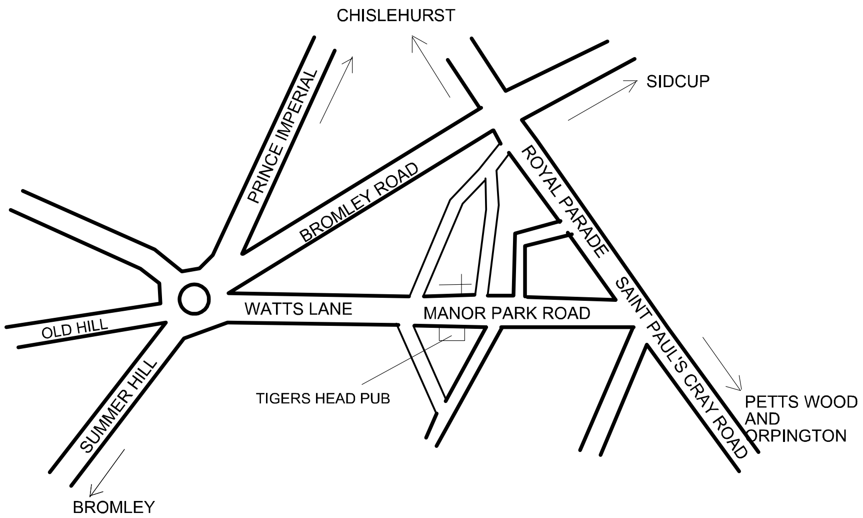
Background. A traffic calming scheme was installed in Watts Lane and its continuation, Manor Park Road, in the London Borough of Bromley in 1999. This consisted of 5 round-top speed humps and 7 pairs of speed cushions (split humps). Photographs of these humps are shown at the end of this article. All of the humps were designed to be 75 mm high. Although some other minor measures were included in the traffic calming scheme, such as kerb realignments, it was primarily a speed hump scheme in nature with the associated signage as is legally required in the UK. The cost of the scheme was approximately £40,000.

A diagram of the position of these roads in relation to the road network is given below. Watts Lane and Manor Park Road act effectively as a short cut between two major distributor roads (Bromley Road, the A222, and St Pauls Cray Road, the A208) and enable traffic to avoid the congested junction of those two roads. There are a number of traffic and pedestrian generators along the road including a church and public house marked on the map, and a large secondary school behind the public house. For that reason, a previous traffic calming measure had been installed some years previously which was a narrow "gateway" near the junction between Watts Lane and Manor Park Road – this prevented larger vehicles such as HGVs or buses from accessing the road travelling in either direction.



Note that a traffic calming scheme was proposed for this road apparently because some residents had called for it as they believed that traffic speed was excessive and the road dangerous. On measurements taken by the Borough Council in 1996, mean traffic speeds in Manor Park Road in both directions were about 35 mph when the legal speed limit on the road is 30 mph. The purpose of this report is to evaluate whether the traffic calming scheme has had any beneficial impact on the number of road traffic accidents in the road under consideration.

Accident Data. Taking information from reports produced by Bromley Borough Council staff in 1998, and another similar report obtained recently, the road accident casualty figures are as follows (the data is based on the Police Stats19 records):

For the three years prior to August 1998: 14 casualties in total (12 slight injuries, and 2 serious injuries) giving an average of 4.7 casualties per year.

For the seven years prior to May 2006: 27 casualties in total (26 slight injuries and 1 serious injury) giving an average of 3.8 casualties per year.

Note that 3 years was used as the period before the humps were installed as this is the standard period often used by road traffic engineers for evaluation purposes in the UK. There were no significant changes to the road layout in that period. Seven years after was used to ensure sufficient data was available for statistical analysis and to avoid temporary, short term impacts. Again no changes were made to the road in that latter period.

In other words there were 4.7 injuries per year before the installation of the humps, and 3.8 injuries per year after the installation of the humps, which gives an apparent improvement of 19%. Note that a separate analysis of the "serious injuries" has not been undertaken because the very low numbers make statistical analysis impossible as they are so infrequent. A "serious accident" in UK reporting generally means treatment that requires an overnight stay in hospital or involves broken bones, whereas a "slight" accident simply implies some injury, however minor, but all such accidents should be reported to the police and recorded under UK law. There were no fatal accidents in either period. No pedestrians were injured in either period so these were all accidents involving vehicle occupants or cyclists/motorcyclists.

Assuming that the reporting of injuries has been consistent then there are two issues here:

1. Are there other factors that could have caused the apparent reduction in accidents?
2. What is the impact of reduced traffic volumes due to traffic diversion?

Factors Reducing Casualty Figures. There are known to be a number of factors that may have had a positive trend on the overall accident and casualty levels on UK roads. The following can be identified:

A – The general improvement in "in-car" safety from improved technology and car safety devices (eg. air-bags) and the phasing out of older cars from use on the roads.
B – The tendency of former pedestrians and cyclists to become car drivers or passengers, where they run a lower injury risk – this particularly applies to schoolchildren in the UK which is very relevant to this location.
C – The recent dry weather, particularly in winter, in the last two years in the UK, as a result of which the UK has been suffering from a drought. This is known to reduce vehicle accidents significantly.
D – Possible underreporting of road accidents, particularly of non-fatal accidents. Recent comparisons of hospital admission data with road accidents reported by the police suggest that underreporting is rising substantially and the Department for Transport is currently researching this issue.

E – Decreased usage of cars by very young drivers, who are known to be more accident prone, due to major increases in the costs of insurance for such drivers.
F – Increased car ownership leading to more congestion and slower traffic speeds.

It is in reality not practical to separate out or estimate the above factors independently, and there may be other countervailing factors also. So the approach taken to remove the influence of these factors is to compare the data at this site with the general trend in accidents in the London Borough of Bromley, ie. the latter will be taken to be a "control" group.

This is justifiable because the road conditions elsewhere in the borough will have been generally similar and the factors mentioned above are likely to have had a similar impact on the site being considered as they have had on the control group. Note that the installation of more speed humps in the borough generally ceased after 1999 which assists in this comparison (this was one of the last major schemes that used them in the borough and soon after the council adopted a policy of "a preference for non-vertical deflection traffic calming schemes"). Ideally it would have been best to identify roads as the control group where no changes had taken place whatsoever but that is not really practical so it should be borne in mind that there will have been other road safety measures taken in the control group roads in many cases (but as a percentage of the roads concerned, the actual number treated is likely to be relatively low).

Control Group Figures. The figures for total casualties in the London Borough of Bromley for similar periods to those under review are (data for exactly comparable periods is not readily available):

For the four years 1994-1998: An average of 1473 casualties per year.
For the seven calendar years 1999 to 2005: An average of 1267 casualties per year.

This shows therefore that there was a 14% reduction in the control group in the comparable period.

Statistical Analysis. So one key question is as follows: *is the achieved benefit of the 19% reduction obtained from the speed hump scheme a statistically significant improvement over the 14% obtained elsewhere in the same borough?*

The best way to test this hypothesis is to use the Chi-Squared statistical test. This is recommended as the preferred technique by ROSPA (the Royal Society for the Prevention of Accidents) in their UK Road Safety Engineering Manual. The data table looks as follows:

	Site	Control	Total
Before	4.7	1473	1477.7
After	3.8	1267	1270.8
Total	8.5	2740	2748.5

The resulting Chi-Squared value is 0.065. This is not significant at the 95% confidence level. In other words, the apparent difference is not statistically significant and any difference between the control group and the group being studied cannot be considered to be other than due to random variability in the frequency of such accidents. It would therefore be erroneous to conclude that the speed humps have had any positive impact on the number of injury accidents at this site based on the data obtained, at least in comparison with other generally similar roads in the same borough where no speed hump schemes were installed.

Data Selection. Note that one question when looking at road accident statistics at this and other similar sites which can be an issue for dispute is "where does the road end". In reality a number of the accidents that nominally took place on the road actually took place at the junctions at each end of the road with other major routes. These are particularly dangerous locations, and at least some such accidents were included in both the data tables provided by the London Borough of Bromley for both the "before" and "after" statistics. To avoid any bias by the author in interpreting the results, the numbers quoted are those using the raw data supplied by the London Borough of Bromley (copies of the detailed accident reports are available upon request from the author).

Effects of Traffic Diversion. One factor that has not been taken into account by the use of a "control group" is the effect of the diversion of traffic by vehicles whose drivers do not like speed humps, for whatever reason. TRL Report 186 (published by TRL, the UK's Transport Research Laboratory through which most government research is undertaken on transport matters) shows that in most traffic calming schemes there is substantial diversion of traffic onto parallel roads after a hump scheme is installed. This could be as high as 25% for example where the diversion was relatively simple (the report gives data for a number of sample sites). Clearly any such diversion will tend to cause accidents to move from the treated road to the diversionary route, other beings being equal and assuming the diversionary route is no safer. In addition there is the issue that those drivers who may wish to drive faster, and who might therefore be potentially more "risky" in attitude or more risk prone in practice, will tend to divert more unless the diversionary route is substantially longer or slower.

In this particular example, congestion occurs on both routes during rush hours, but at other times, although the diversionary route is longer it might be faster (only via Bromley Road and St Pauls Cray Road is probable although there are some other alternatives for those on more lengthy journeys). Therefore it does not seem unreasonable to suggest that at least some diversion might be taking place and a figure of 10% might be anticipated.

Note that unfortunately no traffic volume data was taken soon after the humps were constructed and the change in general traffic volumes since then might result in meaningless data if more recent data was obtained.

Certainly it is possible that the 5% extra improvement in accident figures over the control group may certainly be accountable for by such traffic diversion, and it may well be true that such diversion is the source of many of the alleged road safety benefits reported in other analyses of speed hump schemes.

Conclusion. The data on road accident casualties at this site provides no scientifically sound basis for claiming that there has been any accident reduction caused by the installation of the speed humps. Although impossible of rigorous statistical analysis due to the limited data available, it may even be the case that accident figures have worsened after traffic diversion is taken into account.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