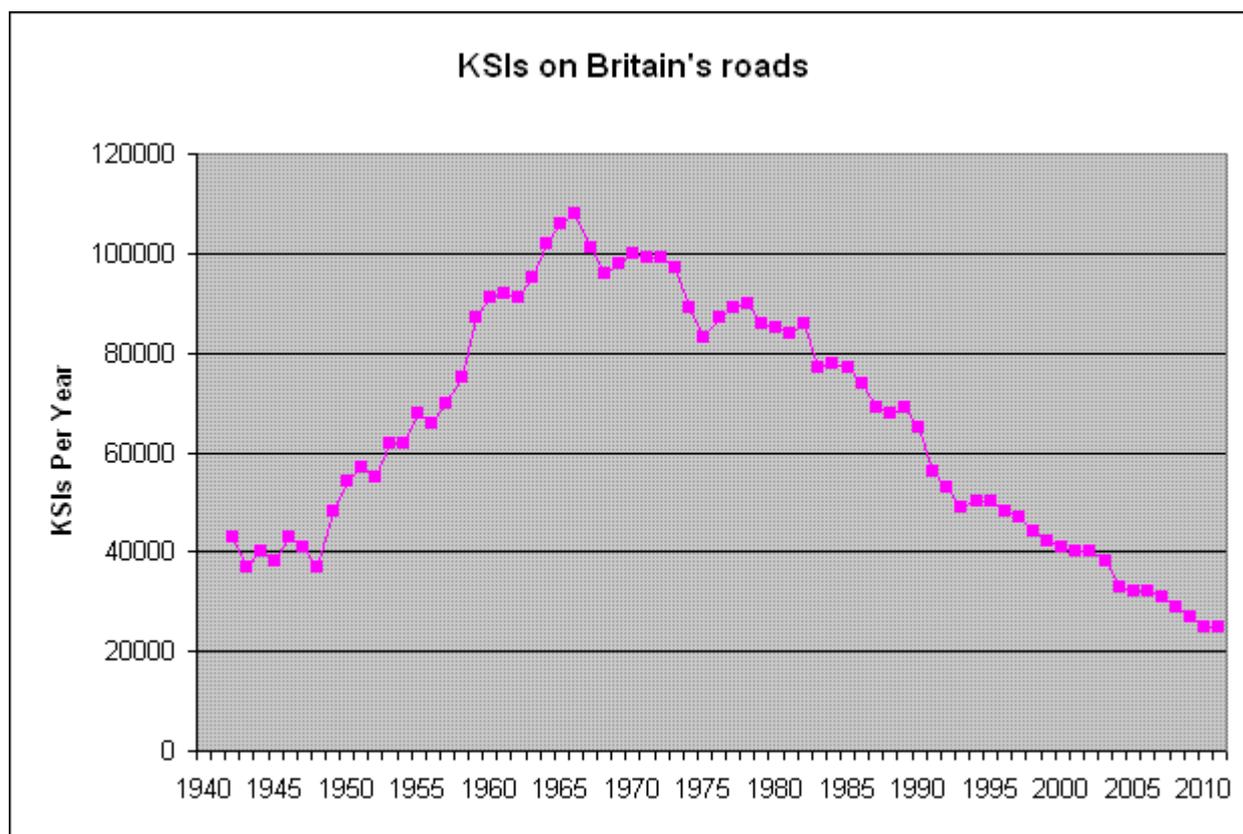


Accident statistics - an inconvenient truth

Introduction

At the present time there is great demand for measures designed to reduce traffic speed, particularly in urban areas, in the belief that this will improve road safety. Campaigners will often point to reductions in accident rates after such measures have been introduced previously and say this proves their case. But there is an obvious flaw in such argument: accident rates have been falling steadily for around 50 years, long before traffic calming or speed cameras were invented. In fact, rates of accident reduction in the UK tailed off around 1990, just when these things came into widespread use!



Data from:

http://www.apccs.police.uk/fileUploads/APCC_Group_Emails/Road_accident_statistics.pdf

which also includes graphs for deaths and all casualties, but mysteriously omits the above graph of KSI (persons killed or seriously injured), which is generally considered the most important measure. The figures for deaths are particularly striking, having virtually flatlined between 1993 and 2007. Incidentally, it is important to bear in mind fluctuations in traffic levels when considering these figures, but that is beyond the scope of this article.

London-specific graphs are available here (p59-60), along with a whole host of summary statistics:

http://www.lscp.org.uk/lrsu/www/downloads/publications/collisions_casualties_london09.pdf

I have for some time been rather suspicious about these claims, as well as being concerned about the adverse side effects of the schemes, so decided to investigate. What follows relates largely to 20mph zones and other traffic calming schemes in London, but similar considerations probably apply in other areas of the country (and world!) as well, and to some extent to speed cameras, traffic lights and other things.

The claims

Studies have often claimed to show significant reductions in accident rates as well as traffic speeds and overall traffic flow in 20mph zones, generally relying on a before-and-after study of individual schemes. The larger studies do generally attempt to allow for the background falls in accident rates, but the approach has a number of fundamental flaws. These are the main ones that I have thought of:

1) Most speed reduction schemes result in a reduction in traffic, which would be expected to lead to a much larger reduction in collisions, for various reasons, as has indeed been observed, although relatively little data seems to have been collected **on traffic volume**. However, in general the traffic does not disappear, but diverts to different routes, which could easily take it a mile or more from the zone in question, which would be expected to lead to additional accidents elsewhere. Accurately quantifying this effect is impossible, so it is simply ignored, or at best assessment is limited to roads on the edge of the zone. Some people may also change their mode altogether, e.g. car to bike, and expose themselves to much greater (probably) danger for the entirety of their journey. An interesting related point is that as more 20mph zones appear in an area, with an increasing number now on main roads, traffic will divert back into the original zones!

2) Considering only the year or three years immediately after scheme introduction is atypical, as users will gradually adjust to the new arrangements and start taking bigger risks over time. "Familiarity breeds contempt." No study I have read has even acknowledged this point. **(Apparently, studies HAVE shown that almost ANY change to road layouts etc. leads to an reduction in accidents initially, while users get used to the new arrangements.)**

3) Schemes, especially the earlier ones that the studies looked at, are often installed in locations with a history of accidents. For one thing this means that the results cannot automatically be applied to other areas which may not have such a history. More importantly, this "history" may be due to statistical variation rather than inherent dangers, and hence a reduction would be expected regardless of whether anything is done. This is called "regression to the mean" and some studies do mention it, but tend to dismiss the effect, without giving any satisfactory explanation.

It is frequently evident that such studies are setting out to demonstrate that 20mph zones are a good idea, and the methodology is biased accordingly, rather than seeking to take an objective approach. **Any scientist will tell you that before-and-after studies are useless without a properly established control group. Although a proper scientific trial would be relatively easy to set up, this has never been done.**

Analysis

One very simple approach I have not seen tried is to compare the overall performance of whole boroughs, which have widely varying policies, ranging from no humps at all (Bromley, Barnet) to 20mph on all roads (Southwark, Islington). In a few cases policies have changed, such as in Croydon where humps were favoured earlier but are now being removed. Accident figures since 2003 are available at a borough level on

<http://www.tfl.gov.uk/corporate/publications-and-reports/road-safety>

and figures for the 5-year period 1994-1998 were available from a previous report:

http://www.lscop.org.uk/lrsu/www/downloads/publications/report_200907_towards2010.pdf

http://www.londonbusroutes.net/miscellaneous/Accident_trends.htm

This approach avoids the inherent flaws of scheme-based studies, as it considers the overall success of each borough's approach on the same basis over quite a long time period, including schemes in all different stages of introduction, and includes the knock-on effects of schemes on the roads outside them. The only problems I can see are:

- 1) There may be reasons other than road safety policy that affect the trends from borough to borough, such as new roads, population changes, and modal split and shift. For example, there has been a huge take-up of cycling in and around central London over the last decade, the effects of which are clearly seen in the results below. Arguably, though, this is all part of the same strain of thinking as 20mph zones, so that it is not necessary to isolate the causes; these factors are certainly interlinked.
- 2) What one borough does could have an effect on neighbouring boroughs, especially near borders. Introduction of traffic calming is likely to displace some accidents to neighbouring boroughs, but, as it turns out, the neighbouring boroughs have still done better!
- 3) (Not a limitation of the approach, but of the data available): A small number of traffic calming schemes had already been installed by 1998. However it was only from 2000 onwards that traffic calming and 20mph zones really took off.

I have compiled figures both for KSI (persons killed/seriously injured) and deaths. The figures in the second category are really too small to be statistically reliable, even if aggregated over a few years. Even for KSIs, large fluctuations can be observed in some boroughs. I have drawn up a comparison between the earlier 1994-1998 period and 2009-2013 (updated July 2014), the latter calculated manually.

http://www.londonbusroutes.net/miscellaneous/Accident_trends.htm

Killed/Seriously injured

Borough	1994-1998	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2009-2013 % reduction	20 zones	exp	chi-sq	Statistically ...	
City of London	323			36	44	43	61	48	51	46	41	49	58	60	254	21.36%	Low	137.81	97.95505	Significant
Tower Hamlets	933			133	133	111	124	151	146	105	91	103	168	87	554	40.62%	High	398.08	61.07215	Significant
Haringey	803			175	131	94	117	78	80	98	79	78	107	106	468	41.72%	High	342.61	45.88904	Significant
Hackney	1043			148	149	124	117	127	162	103	103	108	147	83	544	47.84%	High	445.01	22.01895	Significant
Southwark	1196			195	126	132	138	139	165	127	165	126	117	87	622	47.99%	High	510.29	24.45427	Significant
Hammersmith & Fulham	745			106	113	122	133	103	94	93	74	77	80	53	377	49.40%	Moderate	317.87	11.00117	Significant
Lambeth	1563			209	167	162	195	185	164	173	156	169	151	133	782	49.97%	Moderate	666.88	19.8735	Significant
Islington	928			152	101	90	81	112	75	77	81	100	122	71	451	51.40%	High	395.95	7.655182	Significant
Barnet	1344			197	172	146	147	158	136	137	132	141	112	131	653	51.41%	Low	573.44	11.03892	Significant
Kensington & Chelsea	854			116	105	113	114	120	113	94	80	82	94	64	414	51.52%	Low	364.37	6.759415	Significant
City of Westminster	2043			330	281	263	293	286	272	261	186	160	193	177	977	52.18%	Low	871.68	12.72604	Significant
Lewisham	1032			176	147	145	132	124	113	112	108	102	102	64	488	52.71%	High	440.32	5.163399	Significant
Camden	1248			187	148	131	123	105	123	141	112	100	114	105	572	54.17%	High	532.48	2.933432	Not significant
Richmond upon Thames	677			122	80	72	103	76	64	56	72	69	52	48	297	56.13%	Low	288.85	0.229826	Not significant
Wandsworth	1274			138	150	121	134	166	116	120	102	112	109	99	542	57.46%	Moderate	543.57	0.004542	Not significant
Newham	948			122	114	80	75	105	88	93	81	74	77	57	382	59.70%	High	404.48	1.249219	Not significant
Greenwich	1001			135	113	108	122	130	126	99	104	94	73	28	398	60.24%	Moderate	427.09	1.98161	Not significant
Bexley	731			115	82	87	103	105	73	82	68	49	55	31	285	61.01%	Low	311.89	2.318714	Not significant
Croydon	1234			214	156	158	149	158	132	107	87	109	107	71	481	61.02%	Low	526.50	3.932876	Significant
Redbridge	937			157	118	94	98	96	83	69	76	76	93	51	365	61.05%	Moderate	399.79	3.026646	Not significant
Sutton	580			114	64	66	83	70	74	57	49	45	42	31	224	61.38%	Moderate	247.47	2.22512	Not significant
Enfield	1178			188	173	126	135	98	85	97	98	98	86	72	451	61.71%	Low	502.61	5.299804	Significant
Bromley	1206			160	158	134	163	143	140	127	90	81	90	70	458	62.02%	Low	514.56	6.216628	Significant
Waltham Forest	848			121	105	93	100	92	104	61	67	68	69	54	319	62.38%	High	361.81	5.065796	Significant
Merton	651			97	79	71	74	62	64	55	39	46	65	32	237	63.59%	Moderate	277.76	5.98106	Significant
Hounslow	1132			122	134	120	146	103	102	101	97	73	73	64	408	63.96%	Low	482.98	11.64163	Significant
Brent	1220			189	155	124	107	98	97	101	84	72	86	84	427	65.00%	Moderate	520.53	16.80613	Significant
Kingston upon Thames	620			82	64	63	77	49	65	52	46	44	34	37	213	65.65%	High	264.53	10.03878	Significant
Harrow	609			70	83	76	58	55	52	49	39	37	46	38	209	65.68%	Low	259.84	9.946954	Significant
Havering	1058			154	130	83	120	129	84	75	63	74	78	51	341	67.77%	Low	451.41	27.0058	Significant
Barking & Dagenham	752			99	90	52	67	60	63	45	48	49	47	45	234	68.88%	Moderate	320.85	23.51019	Significant
Ealing	1436			180	147	127	147	137	113	126	85	66	88	81	446	68.94%	High	612.69	45.3506	Significant
Hillingdon	1275			153	157	119	110	116	107	88	83	74	83	59	387	69.65%	Low	544.00	45.30966	Significant
Greater London	33422	6043	5650	4892	4169	3650	3946	3784	3526	3227	2886	2805	3018	2324	14260	57.33%				
% reduction year on year			6.50%	13.42%	14.78%	12.45%	-8.11%	4.11%	6.82%	8.48%	10.57%	2.81%	-7.59%	23.00%						
Low	13664			1977	1755	1540	1702	1595	1411	1320	1136	1096	1127	936	5615	58.91%	Low	5829.95	7.925308	Significant
Moderate	8723			1244	1049	920	1013	970	881	812	732	740	746	556	3586	58.89%	Moderate	3721.80	4.95499	Significant
High	11035			1671	1365	1190	1231	1219	1234	1095	1018	969	1145	832	5059	54.15%	High	4708.25	26.12993	Significant

Deaths only - NOTE highly susceptible to statistical variation.

[\[Excel version, also including figures and analysis for 'all casualties'\]](#)

http://www.londonbusroutes.net/miscellaneous/Accident_trends.htm

Borough	1994-1998	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2009-2013% reduction	20 zones	exp	chi-sq	Statistically ...	
Newham	21			4	4	2	3	8	0	9	5	3	5	3	25	-19.05%	High	12.36	12.93288	Significant
Tower Hamlets	36			6	6	8	6	6	8	7	6	8	5	6	32	11.11%	High	21.18	5.521154	Significant
Croydon	44			14	11	7	6	9	4	5	5	10	5	13	38	13.64%	Low	25.89	5.661298	Significant
Havering	37			17	10	7	5	12	4	5	5	8	8	5	31	16.22%	Low	21.77	3.909804	Significant
Enfield	51			7	8	13	21	12	6	9	7	12	6	8	42	17.65%	Low	30.01	4.78848	Significant
Southwark	35			4	9	7	7	5	8	6	8	5	4	5	28	20.00%	High	20.60	2.661239	Not significant
Bexley	23			4	2	6	6	6	0	5	2	5	4	1	17	26.09%	Low	13.53	0.88715	Not significant
Camden	38			5	4	2	8	6	4	5	7	6	6	4	28	26.32%	High	22.36	1.421539	Not significant
Barnet	58			20	12	12	17	14	18	8	9	8	7	8	40	31.03%	Low	34.13	1.009091	Not significant
Bromley	49			13	10	9	12	7	14	11	3	7	7	5	33	32.65%	Low	28.84	0.601582	Not significant
Barking & Dagenham	27			6	9	6	4	7	8	2	3	4	2	7	18	33.33%	Moderate	15.89	0.280548	Not significant
Lewisham	32			11	5	6	2	6	3	7	3	2	3	6	21	34.38%	High	18.83	0.249815	Not significant
Wandsworth	36			10	8	4	7	2	6	6	3	4	5	5	23	36.11%	Moderate	21.18	0.155507	Not significant
City of Westminster	71			11	9	12	13	5	20	15	4	6	9	6	40	43.66%	Low	41.78	0.075954	Not significant
Ealing	50			18	7	9	10	13	14	7	4	5	8	4	28	44.00%	High	29.42	0.068872	Not significant
Waltham Forest	27			7	1	5	1	3	3	5	2	4	1	3	15	44.44%	High	15.89	0.049709	Not significant
Harrow	22			9	4	3	3	2	0	3	2	3	3	1	12	45.45%	Low	12.95	0.069177	Not significant
Hammersmith & Fulham	24			6	6	10	6	6	3	3	2	3	2	3	13	45.83%	Moderate	14.12	0.089342	Not significant
City of London	15			1	3	1	1	2	2	3	1	0	3	1	8	46.67%	Low	8.83	0.077492	Not significant
Redbridge	39			7	9	7	5	10	6	9	3	2	4	2	20	48.72%	Moderate	22.95	0.379281	Not significant
Haringey	39			16	3	7	8	4	3	6	1	4	3	6	20	48.72%	High	22.95	0.379281	Not significant
Brent	41			2	6	7	10	11	7	8	3	3	4	3	21	48.78%	Moderate	24.13	0.405351	Not significant
Richmond upon Thames	14			2	6	2	6	2	1	3	1	2	1	0	7	50.00%	Low	8.24	0.18621	Not significant
Hounslow	50			9	15	14	13	9	3	6	7	7	2	3	25	50.00%	Low	29.42	0.665035	Not significant
Lambeth	55			13	4	8	10	10	12	2	2	10	6	7	27	50.91%	Moderate	32.37	0.889603	Not significant
Hackney	45			4	8	4	7	2	6	4	5	3	5	5	22	51.11%	High	26.48	0.758313	Not significant
Hillingdon	57			5	11	8	6	9	13	5	8	7	5	2	27	52.63%	Low	33.54	1.276239	Not significant
Greenwich	46			7	10	8	13	8	12	8	5	2	3	2	20	56.52%	Moderate	27.07	1.846349	Not significant
Sutton	32			6	3	2	2	2	2	3	2	4	2	2	13	59.38%	Moderate	18.83	1.805597	Not significant
Kensington & Chelsea	35			9	5	10	3	8	4	2	3	5	1	2	13	62.86%	Low	20.60	2.801764	Not significant
Merton	25			6	2	1	5	4	4	2	2	1	3	0	8	68.00%	Moderate	14.71	3.062028	Not significant
Islington	43			10	2	4	2	7	4	3	2	4	1	3	13	69.77%	High	25.30	5.982965	Significant
Kingston upon Thames	32			3	4	3	3	5	2	2	1	2	1	1	7	78.13%	High	18.83	7.433148	Significant
Greater London	1249	298	280	272	216	214	231	222	204	184	126	159	134	132	735	41.15%				
% reduction year on year			6.04%	2.86%	20.59%	0.93%	-7.94%	3.90%	8.11%	9.80%	31.52%	-26.19%	15.72%	1.49%						
Low	526			121	106	104	112	97	89	80	57	80	61	55	333	36.69%	Low	309.54	1.778718	Not significant
Moderate	325			63	57	53	62	60	60	43	25	33	31	31	163	49.85%	Moderate	191.25	4.173697	Significant
High	398			88	53	57	57	65	55	61	44	46	42	46	239	39.95%	High	234.21	0.097907	Not significant

http://www.londonbusroutes.net/miscellaneous/Accident_trends.htm

I have crudely categorised the boroughs as having low (<10%), moderate and high (>30%) proportions of 20mph roads using the data here:

https://www.whatdotheyknow.com/request/20mph_zones_in_london

<http://londontransportdata.wordpress.com/2011/08/03/update-on-20mph-zones-in-london/>

The [London ISA Map \(2009\)](#) may help to visualise this. Whilst I am not fully familiar with all boroughs, I believe the proportion of 20mph zones broadly reflects the proportion of traffic calming generally. Most early traffic calming schemes were introduced without reducing the speed limits, but in many cases this has been done subsequently.

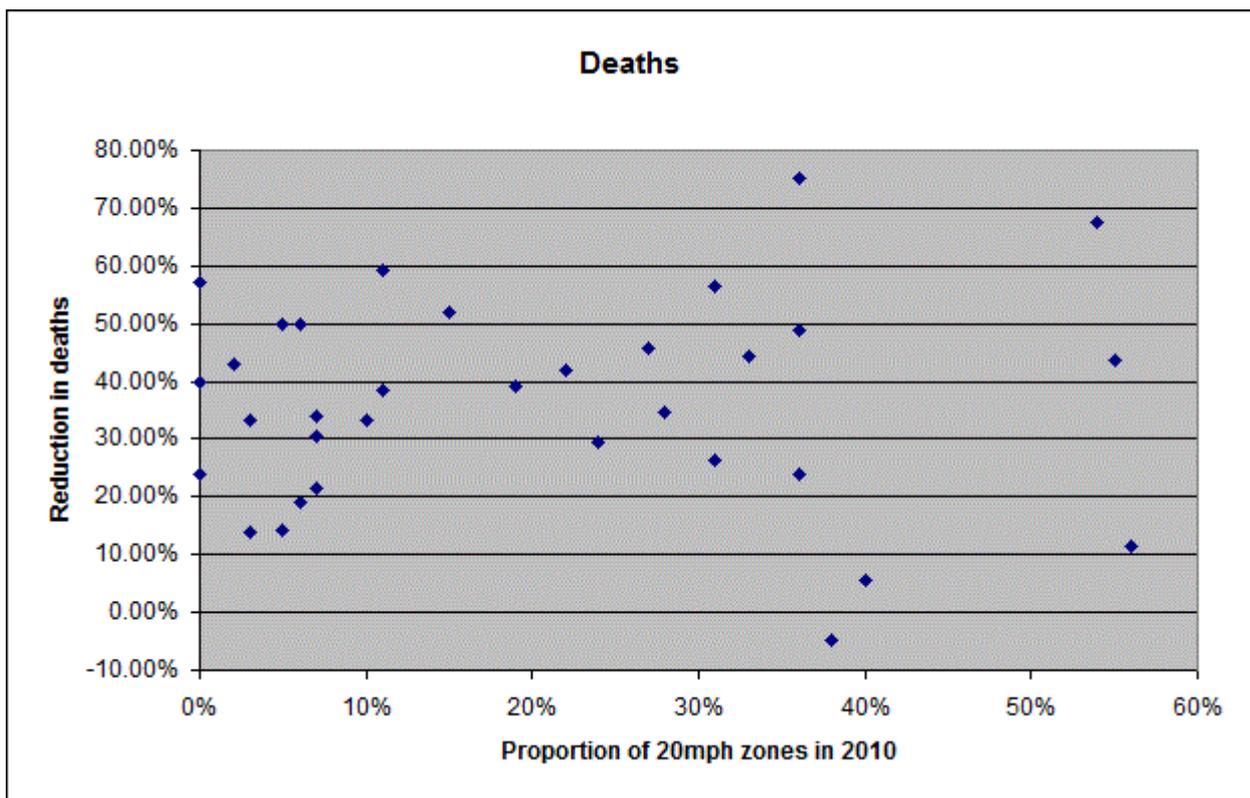
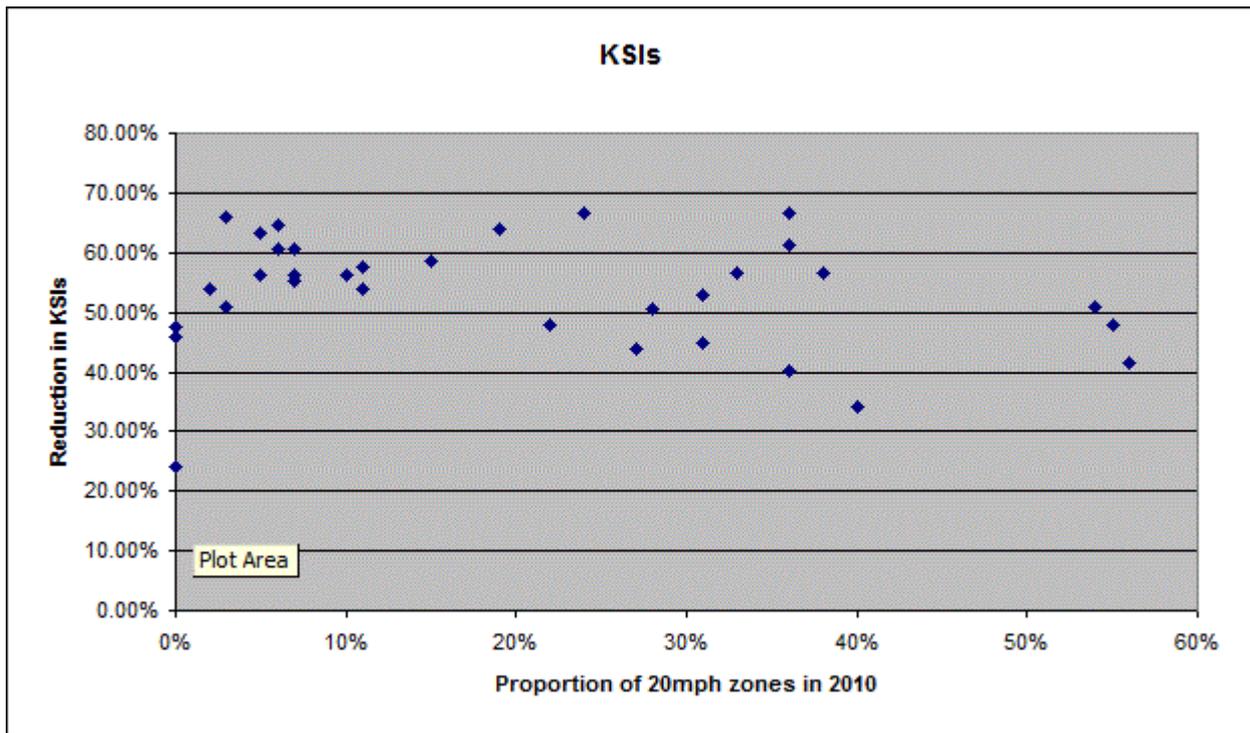
The headline figures for casualty reduction are:

Level of traffic calming	Reduction for		
	Deaths	KSIs	All
Low	36.69%	58.91%	39.24%
Moderate	49.85%	58.89%	38.63%
High	39.95%	54.15%	35.34%

It will be seen that there is very little difference in the figures for both KSIs and all casualties, with in fact the correlation being the reverse of what is generally claimed. Despite these figures being so close, they are statistically significant (i.e. there is enough data to be reasonably sure that this is not a fluke). Of course, correlation does not prove causality, but this at least reliably refutes the claim that widespread traffic calming and 20mph zones produce above-average reductions in KSI rates, and if anything the reverse is true once usage becomes widespread.

Whilst the figures for deaths only do come out slightly more favourable for intervention, even after categorisation the results for 'Low' and 'High' are still not statistically significant. A single major accident can cause differences of as much as 5 percentage points in the number of deaths. This illustrates why the KSI statistics are generally regarded as the most useful and important.

Meanwhile it is now possible to plot accident reduction rates against the proportion of zones in each borough, so that the (weak) negative correlation can be visualised. This is comparing 1994-1998 with 2008-2012 (i.e. not updated with 2013 data).



Comment

This conclusion will probably seem counter-intuitive to most people, used to being fed a diet of "speed kills." So let's examine some of the reasons why focusing on speed may be counterproductive. I live in an area (Lewisham) where many 20mph zones have been introduced and have closely monitored their effects "on the ground".

- 1) A frequent comment is that research has shown that a pedestrian has a 90% chance of surviving an accident at 20mph, as against 50% at 30mph. Well yes, but so what? For one thing, a vehicle travelling at 30mph is very likely to brake to below 20mph before colliding anyway. But most serious accidents in urban areas do actually occur at low speed, often at junctions. Police figures apparently show that only around 5% of KSI accidents involve vehicles travelling at illegal or inappropriate speed. That people are allowed to drive at 30mph does not mean they will do so when there is any danger. Most drivers are quite good at slowing down when there is.
- 2) Traffic calming measures are themselves a hazard. They cause erratic driving and cycling and can lead to people losing control. They often force people onto a potential collision course. Humped pedestrian crossings distract drivers so that they are less likely to see the pedestrians. Overtaking a bike travelling at 15mph (say) takes far longer at 20mph than at 30mph, and is consequently more dangerous.
- 3) If vehicles travel more slowly, then they will take longer to clear any bit of road space. This reduces the time that is available for crossing the road or making tricky manoeuvres, forcing people to take bigger risks. On a two-way road with moderate levels of traffic flow, the overall effect is quite dramatic. For example, using a crude analysis, if vehicle flow is 600 per hour (each way) then at 30mph it may be safe to cross 25% of the time, but at 20mph only 6.25%. This is simplistic - in practice, with traffic calming vehicles often speed up and slow down unpredictably, meaning it is far harder to judge gaps in traffic. Bear in mind that a 20mph zone does not mean vehicles travelling at 20mph, especially where traffic calming is involved. Humps slow some vehicles to 5-10mph, and chicanes can lead to queues of traffic waiting to get through.
- 4) Speed reduction measures may lead people into a false sense of security, for example pedestrians walking near or on the carriageway. Pedestrians often think they have priority to cross roads when they do not - indeed many schemes are designed to encourage this, in the hope of slowing vehicles down, which is fine ... until both pedestrian and driver think they have priority. Similarly, the measures may encourage cycling, indeed that is often a major objective, but cycling is inherently dangerous.
- 5) Contrary to popular belief, most accidents occur on main roads - see p20 of the 2nd link on this page. Traffic calming typically encourages people to divert off safe low-congestion "residential" routes onto relatively unsafe congested main roads (most of which are themselves residential, of course). Furthermore, in my experience, there are far more vulnerable road users on main roads than local roads.
- 6) Focusing on speed diverts attention from the real issues, such as drivers, cyclists and pedestrians not concentrating or following the rules of the road. Real policemen catching people for real dangerous driving have been replaced with cameras catching people for breaking the law.

All this is of course without considering the very obvious disbenefits of traffic calming, humps in particular. Humps can directly cause injuries such as back pain, especially for bus passengers, and they also damage vehicles. They also delay emergency service vehicles - some years ago the London Ambulance service suggested this could result in as many as 200 "extra" deaths per year (more than the *total* number of deaths in accidents!). Driving at lower speeds and constant acceleration and braking also cause additional pollution, leading to further illnesses and deaths. There are also increases in noise pollution. Slower traffic means more congestion, further increasing pollution and reducing economic productivity.

Personally I'm not a great deal affected by traffic calming as most of my travel is by rail. My concern about this subject is twofold: one, this country seems to be sleepwalking into accepting, and spending large amounts of money on, a set of ideas that are intuitive but false, and actually

http://www.londonbusroutes.net/miscellaneous/Accident_trends.htm

seem to have the opposite effect to that intended; and secondly, as a firm advocate of good bus services and an industry insider, I see the enormous damage done to bus service provision and reliability by the introduction of traffic schemes. Bus journey times in London continue to rise by 1-2% per year, despite overall traffic levels falling, and I believe this is almost entirely due to the way the road network is being managed. There is much talk about a 20mph London-wide limit, and this alarms me enormously - bus services may have to be cut by 20-30%, unless a massive increase in subsidy is forthcoming. My hope is that people will read this article and start to think critically about what they are being told, rather than just accepting conventional thinking.

Initially published on 28 November 2013

Improved versions published on 29 November, 2 December 2013

Finalised version published on 5 December. Only very minor changes to text, plus HTML code alterations.

Updated 3 July 2014 following publication of accident figures for 2013. Some minor changes have been made to the text, which are coloured green. No changes were needed to the main conclusions. Sub-headings were also added.