PUIC Road: Review of effectiveness (review 1) - Evidence Tables (Appendix 5)

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Blomberg RD, Cleven AM, Thomas lll FD, Peck Sr RC. **Year:** 2008 **Title:** Evaluation of the Safety Benefits of Legacy Safe Routes to School Programs **Aim of study:** 1. To determine the feasibility of conducting a systematic and practically meaningful crash-based evaluation of SRTS programs. 2. (If feasibility is shown) To conduct a study to examine the safety effects of implementing legacy SRTS programs **Study design:** Non-RCT **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** Evaluation of sites which had applied for SRTS funding and implementated SRTS programs. **Study sufficiently powered?** NA	**Country:** United States **Describe country details:** Developed country, with a dominantly private-financed and private-provided health care system **Setting:** SRTS sites in 3 US states. State 1: 29 SRTS programs in 21 different cities. State 2: 14 SRTS programs in 7 cities. State 3: 10 programs in 2 cities. **Location:** Main crash data presented is from 3 US states (which States not identified). Most SRTS programs appeared to be within cities. **Selected area(s) / population(s):** Of the 130 'legacy' SRTS programs included in the overall report, 53 were in the three States for which crash outcome data were analysed. Elementary school-age children involved in crashes as pedestrians or cyclists, both within and outside SRTS sites, and within and outside typical school travel times (being 6.45 to 9.15am, and 1.30 to 4.30pm, on school days, in school term time) **Excluded population/s:** Children	**Arm No:** 1 **Name:** Peds/Cyclists age 4-12 at SRTS Sites and school trip times & dates **Type of intervention:** Safe Routes to School **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 2 **Name:** Passengers age 4-12 at SRTS Sites and school trip times & dates **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** -	Number of child pedestrians/cyclists involved in crashes	**Limitations identified by author:** No standard methods for reporting either the process or te outcomes of the programs. Heterogeneity of SRTS programs evaluated (size, focus and duration); for 'a large proportion' crash reduction was not primary objective. Not all elementary schools within the defined SRTS program sites were involved in the local SRTS program. Had to assume that the desired modal shift (to increased walking and cycling) took place; otherwise, any measured reductions in crash-involved pedestrians and cyclists could be due to reduced exposure. (however, no apparent reasons for a significant reduction in walking or cycling over the period. Possibility of spill-over effects beyond immediate SRTS program sites, and possibility of SRTS program sites in same state which did not participate in this study - would affect comparisons with statewide crash trend data. **Limitations identified by review team:** Not clear what the key comparison should be, given the large number of comparisons made (between crash trends over time: at SRTS sites vs State-wide; for pedestrian/cyclists vs

	aged 13 and over or 3 and under. **Study year(s):** State 1: 1996-2004 (9 years) State 2: 1996-2004 (9 years) State 3: 1996-2003 (8 years) **Age of group data collected for:** 4 to 12 years old (elementary school age) (NB. some comparisons with crash trends for other age-groups) **Other data collection notes:** -	**Arm No:** 3 **Name:** Peds/Cyclists age 4-12 Statewide at All times & dates **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 4 **Name:** Peds/Cyclists age 4-12 Statewide at school trip times & dates only **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 5 **Name:** Passengers age 4-12 Statewide at school trip times & dates **Type of intervention:** No intervention **Details of other components of scheme/intervention (if		passengers involved in crashes; for age 4-12 years vs those aged 0-3 and 13 and over, and; for crashes occurring at School calendar dates and times vs those at all dates and times). i.e. there is a concern over multiple significance testing which has not apparently been accounted for in the caalculations of statitistical significance. **Evidence gaps and/or recommendations for future research (as stated by authors):** More formal evaluation (specifically, for the new - post-2005 - generation of SRTS programs under SAFTEA-LU legislation and funding) **Source of funding:** National Highway Traffic Safety Administration (USA)

		applicable): - **What delivered:** - **Arm No:** 6 **Name:** Peds/Cyclists age 0-3 & 13+ at SRTS Sites and school trip times & dates **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 7 **Name:** Peds/Cyclists age 0-3 & 13+ Statewide & All times & dates **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** -		
Baseline characteristics				

Results

	Peds/Cyclists age 4-12 at SRTS Sites and school trip times & dates			Passengers age 4-12 at SRTS Sites and school trip times & dates				
	N	K	MEAN	N	K	MEAN	Δ	*P*
State 1 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.003
State 2 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.056
State 3 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.004

	Peds/Cyclists age 4-12 at SRTS Sites and school trip times & dates			Peds/Cyclists age 4-12 Statewide at All times & dates				
	N	K	MEAN	N	K	MEAN	Δ	*P*
State 1 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.087
State 2 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.072
State 3 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.382

	Peds/Cyclists age 4-12 at SRTS Sites and school trip times & dates			Peds/Cyclists age 4-12 Statewide at school trip times & dates only				
	N	K	MEAN	N	K	MEAN	Δ	*P*
State 1 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.069
State 2 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.199
State 3 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.290

	Peds/Cyclists age 4-12 at SRTS Sites and school trip times & dates			Passengers age 4-12 Statewide at school trip times & dates				
	N	K	MEAN	N	K	MEAN	Δ	*P*
State 1 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.000
State 2 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.000
State 3 Crash-involved children: Number of child pedestrians/cyclists involved in crashes	0			0				0.049

	Peds/Cyclists age 4-12 at SRTS Sites and school trip times & dates			Peds/Cyclists age 0-3 & 13+ at SRTS Sites and school trip times & dates				
	N	K	MEAN	N	K	MEAN	Δ	*P*
State 1								
Crash-involved children:								
Number of child pedestrians/cyclists involved in crashes	0			0				0.000
State 2								
Crash-involved children:								
Number of child pedestrians/cyclists involved in crashes	0			0				0.292
State 3								
Crash-involved children:								
Number of child pedestrians/cyclists involved in crashes	0			0				0.340

	Peds/Cyclists age 4-12 at SRTS Sites and school trip times & dates			Peds/Cyclists age 0-3 & 13+ Statewide & All times & dates				
	N	K	MEAN	N	K	MEAN	Δ	*P*
State 1								
Crash-involved children:								
Number of child pedestrians/cyclists involved in crashes	0			0				0.000
State 2								
Crash-involved children:								
Number of child pedestrians/cyclists involved in crashes	0			0				0.007
State 3								
Crash-involved children:								
Number of child pedestrians/cyclists involved in crashes	0			0				0.051

'T-value' is the difference between the linear regression coefficients (i.e. Coeff. A - Coeff B) of the different time-series data, divided by the square root of the difference of their Standard Errors squared (i.e. v((SE A)sqrd - (SE B)sqrd)). Sugnificance tests were 2-tailed based on the T-distribution (for small sample sizes).

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Chorlton E. **Year:** 1990 **Title:** Burnthouse lan traffic calming scheme **Aim of study:** To outline the design, development and construction of the Burnthouse Lane Traffic Calming scheme and to give details of the extensive before and after studies associated with the scheme. **Study design:** Uncontrolled B&A **Quality score:** - **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** Burnthouse Lane, Devon. A pilot demonstration scheme. Burnthouse Lane forms part of what was designed in the 1930's as an intermediate ring road lying between the Inner Bypass and the 'famous' Exeter bypass. It is the main artery of an extensive council estate, bounded by slightly older private properties. It is used as a connector and main distributor road. One end of the Exeter cycle scheme started at the junction at one end of the road. Accidents were a problem before hand, with many involving pedestrians and cyclists. There are 3 schools and a nursery situated on the road, and many of the casualties involved children travelling to/from school. There are also shops, a surgery, village hall, churches and a public house along the road. The authors state the area was 'in need of an environmental uplift'. Burnthouse Lane functioned at a number of different levels. To some motorists it was a fast, short-cut or rat run, around the eastern side of the city centre, to others it was part of a distributor road system that enabled them to access their home or workplace. It is a route to a number of schools. It is an area where people shop and relax. Part of it is on a bus route and it is an area in which children play. It is also a residential road which acts as the communal centre for a much wider area.	**Arm No:** 1 **Name:** Before traffic calming **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** A long straight road with uninterrupted visibility of 1/2km. There was a brow of a hill immediately outside one of the schools causing visibility problems, particularly for the school crossing patrol. The width of the road was 12.5m, giving rise to considerable volumes of traffic for a residential road. Over the years the road has been neglected, maintenance had been carried out but no attempt had been made to improve its appearance. **Arm No:** 2 **Name:** After traffic calming **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** Meetings were held with local councillors, the heads of local schools, the appropriate officers of the City Council, and the school governors of local schools. A Community Liaison Group was	All casualties (all)	**Limitations identified by author:** The authors state that it is too early to draw any clear conclusions about the reduction in accidents. **Limitations identified by review team:** - **Evidence gaps and/or recommendations for future research (as stated by authors):** The authors state that more accident data covering a longer period is required. **Source of funding:** The paper was produced by commission of Michael Hawkins OBE, County Engineer and Planning Officer of Devon County Council.

	Location: Urban **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** The intervention was implemented in 1988. Accident data were collected for the 5 years before (presumably between 1982-1987, and 18 months after the intervention, (presumably between 1989-1990); however, for child casualties, annual rates are given. **Age of group data collected for:** Aged 10 years and younger. **Other data collection notes:** Speed data are reported, but not mean speeds, so they have not been recorded here.	also set up, consisting of County Councillors, City Councillors, the Community Association, head teachers, Chairman of Governors, the local Inspector and Community Constable for the Police, and the manager of the bus service. Officers involved came from a number of disciplines including traffic engineers, the Road Safety Officer, design engineers, and a landscape designer. Draft plans and a programme were presented to this group. At one of the meetings it was agreed to introduce a road safety education programme for the school children, both with respect to information about the scheme and how it would operate, and also relating to the avoidance of danger during the progress of the works. It is unclear whether this education programme actually took place, and when. Leaflets were distributed to each house in the area. There was an official opening of the scheme with unveiling of plaques and planting of trees. Children from the local school planted two raised gardens outside the school. **What delivered:** A traffic calming scheme was introduced. The total length of the scheme was 0.6km. This included to following features: the main carriageway width was reduced from 12.5m to 5.5m; 1m wide cycle tracks were introduced in both directions; sheltered parking was provided between speed tables; sheltered access was provided for cycle tracks at both ends of the scheme; speed tables were provided on all side roads entering Burnthouse Lane and either side of each junction on		

		Burnthouse Lane itself. The presence of the approach ramp to speed tables was highlighted by use of a white triangle marked on the highway. Accesses to private drives were laid in grey concrete blocks across the pavement and raised planters with trees and other foliage were constructed. The alignment of the road was changed removing the impression of a wide straight fast road. Two types of street lighting were provided. Additional footway and planters were provided outside one of the schools instead of further sheltered parking.		

Baseline characteristics

Results

	Before traffic calming			After traffic calming				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
All casualties (all)	1	3	[a]	1	0	[b]	RaR=0.143 (SE 4.535)	0.083[c]

[a] Although data are said to be collected over 5 years, the annual rate is given.
[b] Although data are said to be collected over 18 months, the annual rate is given.
[c] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

Speed data are reported, but not mean speeds, so they have not been recorded here.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Cloke J, Webster D, Boulter P, et al. **Year:** 1999 **Title:** Traffic calming: Environmental assessment of the Leigh Park Area Safety Scheme in Havant **Aim of study:** To evaluate the impact of a traffic calming scheme implemented in Leigh Park, Havant, Hampshire in 1997 on the physical environment (traffic speeds and flows, accident frequency, vehicle emissions, air quality and noise levels); and to assess the impact it has on the human environment in terms of public perception and acceptance of the scheme. The aim of the traffic calming scheme was to discourage through traffic and reduce vehicle speeds. **Study design:** Uncontrolled B&A **Quality score:** - **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	**Country:** UK **Describe country details:** Developed; public health care system **Setting:** Leigh Park is an estate. It is largely residential (about 70%), with some recreational space, open space and light industry. The roads bounding the area cover about 5km, and the roads within it cover about 15km. Buses operate within the area. All of the roads within the area are single carriageway with street lighting, and are subject to a 30mph speed limit. It was decided to implement a traffic calming scheme in Leigh Park due to the high level of vulnerable road user casualties. **Location:** Urban **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** Phase 1 was completed by April 1997, and phase 2 by September 1997. 'Before' injury accident data were collected for a period of 3 years between 1994-1997, and 'after' data were collected for a period of 20 months between 1997-1998. **Age of group data collected for:** NR **Other data collection notes:** -	**Arm No:** 1 **Name:** Before traffic calming scheme **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Pelican crossings were already in place. **Arm No:** 2 **Name:** After traffic calming scheme **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** Extensive consultation was carried out by HCC with the emergency services, bus companies and the local residents. **What delivered:** A variety of measures were introduced. Speed cushions were installed in sets of 2 or 3. The cushions were spaced approximately 30 to 70m apart. Staggered pairs of cushions were used in conjunction with pedestrian refuges at some locations to slow traffic at the crossing points. The pelican crossings already in place were converted to humped pelican	Injury accidents involving children	**Limitations identified by author:** More time will be required before any meaningful conclusions can be drawn as to the long term effect of the measures on accident frequency. **Limitations identified by review team:** Age range of 'children' not specified. The injury accident data in children is not reported very clearly. **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The report was produced by the TRL, under/as part of a contract placed by the Department of the Environment, Transport and the Regions (DETR).

		crossings. A raised junction with red surfacing was installed. At the crossing points on this raised junction the kerb was flush with the plateau, and tactile paving was provided to assist the visually impaired. Mini-roundabouts were installed at 4 junctions. Pedestrian refuges and traffic islands were installed to slow traffic, discourage overtaking and assist pedestrians when crossing the road. These features incorporated illuminated bollards. Gateways were installed to alert drivers to the scheme; and build-outs were used to rationalise parking by creating sheltered spaces. The build-outs featured non-illuminated bollards, and cross-hatching, to deter parking in unsatisfactory locations. The scheme was installed in 2 phases.		

Baseline characteristics

Results

	Before traffic calming scheme			After traffic calming scheme				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Injury accidents:								
Injury accidents involving children	1	10	[a]	1	5		RaR=0.500 (SE 1.729)	0.197[b]

[a] The number of injury accidents before the intervention was not actually reported, but the authors state that: 'accidents to children [have] been halved, to 5 per year.'
[b] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

Speed data were also collected using a radar gun at various different locations along one of the roads within the scheme. Speed measurements were made of about 100 vehicles in each direction at each of 7 locations, 'before' and 'after' implementation of the scheme. All of the measures had the effect of reducing speeds, and all speed reductions were significant ($p<0.05$). Speeds were reduced by up to 12mph, depending on the type of measure and location. The cushions, raised junction, and mini-roundabout were the most effective, giving an average speed reduction of 11-12mph. Speed reductions between the sets of cushions were slightly lower, and the speed reduction at the pedestrian refuge was about 5mph. However, the authors state that this was not sufficient to reduce the mean speed to below 30mph.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Dean D. **Year:** 1993 **Title:** The Stockton cycle route after study (1986) **Aim of study:** To provide an objective assessment of the Stockton Cycle route based on data collected before and after the route was opened. More specifically to observe: whether cyclists are attracted to the cycle route from other roads and whether its introduction has encouraged cycling; the levels of use of the various parts of the route; whether there are any problems relating to the operation of the route; and the effect on cyclist accidents of the route both locally and in the surrounding area. **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** The Stockton (County of Cleveland) Cycle Route is one of 5 large scale cycling projects. The authors state that females make up a very small percentage of the total cyclists in the Stockton-on-Tees area. **Location:** Mixed urban/rural **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** The cycle route was implemented in 1985. 'Before' data was collected for an 18 month period between 1983-1985, and 'after' data was collected for an 18 month period between 1985-1986. **Age of group data collected for:** 14 years and under. **Other data collection notes:** Accident data was obtained from Cleveland County Council in the form of individual accident reports.	**Arm No:** 1 **Name:** Before cycle route **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 2 **Name:** After cycle route **Type of intervention:** Cycle routes/networks **Details of other components of scheme/intervention (if applicable):** - **What delivered:** One of the lane sections follows the line of a disused railway and is about 2.1km long. The other section runs from the line of the disused railway along an existing footway between a school and a college, continuing to the town centre via two roads	Pedal cyclist 'slight' casualties Pedal cyclist casualties (all) Pedal cyclist KSI casualties(KSI casualties includes 'Serious' and 'Fatal' casualties which have been reported separately in this study.)	**Limitations identified by author:** As the two data collection periods were relatively short it was not possible to reach firm conclusions. Also, the 'before' period contained 2 winters, where, the authors state, it would be expected that cyclist accidents would be at their lowest. The 'after' period had only one winter period. **Limitations identified by review team:** - **Evidence gaps and/or recommendations for future research (as stated by authors):** In order to establish if the downward trend of cycle and pedestrian use has continued, the authors state that it may be of value to repeat the counts taken on the cycle route. **Source of funding:** Prior to the introduction of the scheme, Transportation Planning Associates were commissioned by the TRRL to carry out a comprehensive data collection and analysis study in the area around the cycle route. The 'after' study was also commissioned by the TRRL.

		and an existing pedestrian tunnel; this section is 2.2km. Provision was made for pedestrians as well as cyclists to use the route. **Arm No:** 3 **Name:** Before cycle route - outside catchment area **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Data provided for areas outside the catchment area of the cycle route, but within Stockton-on-Tees. **Arm No:** 4 **Name:** After cycle route - outside catchment area **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Data provided for areas outside the catchment area of the cycle route, but within Stockton-on-Tees.		

Baseline characteristics

Results

	Before cycle route			After cycle route				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
Pedal cyclist 'slight' casualties	1.5	6		1.5	8		RaR=1.333 (SE 1.716)	0.593[a]
Pedal cyclist casualties (all)	1.5	8		1.5	11		RaR=1.375 (SE 1.591)	0.491[a]
Pedal cyclist KSI casualties	1.5	2		1.5	3		RaR=1.500 (SE 2.491)	0.655[a]
5-9 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	2		1.5	1			
10-14 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	3		1.5	7			
0-4 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	1		1.5	0			
5-9 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	3		1.5	2			
10-14 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	4		1.5	9			
0-4 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	1		1.5	0			
5-9 years								
Casualties:								
Pedal cyclist KSI casualties	1.5	1		1.5	1			
10-14 years								
Casualties:								
Pedal cyclist KSI casualties	1.5	1		1.5	2			

0-4 years								
Casualties:								
Pedal cyclist KSI casualties	1.5	0		1.5	0			

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

	Before cycle route			After cycle route - outside catchment area				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
Pedal cyclist 'slight' casualties	1.5	6		1.5	10			
Pedal cyclist casualties (all)	1.5	8		1.5	11			
Pedal cyclist KSI casualties	1.5	2		1.5	1			
5-9 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	2		1.5	3			
10-14 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	3		1.5	7			
0-4 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	1		1.5	0			
5-9 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	3		1.5	4			
10-14 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	4		1.5	7			
0-4 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	1		1.5	0			
5-9 years								
Casualties:								
Pedal cyclist KSI casualties	1.5	1		1.5	1			
10-14 years								
Casualties:								
Pedal cyclist KSI casualties	1.5	1		1.5	0			

0-4 years								
Casualties:								
Pedal cyclist KSI casualties	1.5	0		1.5	0			

	After cycle route			After cycle route - outside catchment area				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
Pedal cyclist 'slight' casualties	1.5	8		1.5	10			
Pedal cyclist casualties (all)	1.5	11		1.5	11			
Pedal cyclist KSI casualties	1.5	3		1.5	1			
5-9 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	1		1.5	3			
10-14 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	7		1.5	7			
0-4 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	0		1.5	0			
5-9 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	2		1.5	4			
10-14 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	9		1.5	7			
0-4 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	0		1.5	0			
5-9 years								
Casualties:								
Pedal cyclist KSI casualties	1.5	1		1.5	1			
10-14 years								
Casualties:								
Pedal cyclist KSI casualties	1.5	2		1.5	0			

0-4 years								
Casualties:								
Pedal cyclist KSI casualties	1.5	0		1.5	0			

	Before cycle route - outside catchment area			After cycle route - outside catchment area				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
Pedal cyclist 'slight' casualties	1.5	6		1.5	10		RaR=1.667 (SE 1.676)	0.317[a]
Pedal cyclist casualties (all)	1.5	7		1.5	11		RaR=1.571 (SE 1.622)	0.346[a]
Pedal cyclist KSI casualties	1.5	1		1.5	1		RaR=1.000 (SE 4.113)	1.000[a]
5-9 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	5		1.5	3			
10-14 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	1		1.5	7			
0-4 years								
Casualties:								
Pedal cyclist 'slight' casualties	1.5	0		1.5	0			
5-9 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	5		1.5	4			
10-14 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	2		1.5	7			
0-4 years								
Casualties:								
Pedal cyclist casualties (all)	1.5	0		1.5	0			
5-9 years								
Casualties:								
Pedal cyclist KSI casualties	1.5	0		1.5	1			

10-14 years				
Casualties:				
Pedal cyclist KSI casualties	1.5	1	1.5	0
0-4 years				
Casualties:				
Pedal cyclist KSI casualties	1.5	0	1.5	0

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

The authors note that in the 'before' period there were no fatalities, where as in the 'after' period there were 3, 2 within the catchment area and 1 outside. However, the 'before' period contained 2 winters, where, the authors state, it would be expected that cyclist accidents would be at their lowest. The 'after' period had only one winter period.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Department for Transport. **Year:** 2001 **Title:** Report on the Gloucester Safer City Project **Aim of study:** To gauge the early success of the Gloucester Safer City project (GSCP). The main aim of the GSCP was to reduce casualties by at least one third by April 2002 (compared to the baseline average for 1991-95). **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** The city of Gloucester. Gloucester had a population of 100,165 in 1991 and is virtually freestanding. While Gloucester's image is of a typical cathedral city and county town, it had extensive industry in the 19th century and was a major port. Gloucester has a car ownership rate of 439 per 1,000 population, which is above the national average but lower than for the county as a whole (499 per 1,000). At 5.72 per cent, the ethnic minority population is below the national average but high for the south west. **Location:** Urban **Selected area(s) / population(s):** In order to be eligible for the 'Safe Town Initiative' grant, bidders had to satisfy the following criteria:	**Arm No:** 1 **Name:** Before GSCP **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 2 **Name:** After GSCP **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** As well as local safety	All casualties (all) Pedestrian casualties (all) Pedal cyclist casualties (all) All KSI casualties(KSI casualties includes 'Serious' and 'Fatal' casualties which have been reported separately in this study.) All 'slight' casualties	**Limitations identified by author:** At the time of preparing the report, they only had provisional results for 2000. It should be noted that the casualty figures are small, especially when disaggregated, and subject to random variation. The project did not finish until the end of March 2001. The project team was still carrying out substantial work in the first three months of this year. In addition, the full benefits of the many works carried out in 2000 will not be reflected in that year's figures. The figures for fatalities are not high enough for the reduction to be statistically significant. The authors also note that: the Gloucester experience will not necessarily transfer to all similar locations. Locations have different problems which they will need to remedy in different ways according to local circumstances. **Limitations identified by review**

	- the town or city should ideally be surrounded by countryside, not part of a wider conurbation, so that any effects could be measured within it; - it would have to have a population of around 100,000 to allow the effects to be statistically significant (national figures suggested that a town or city with this population would normally experience around 500 road casualties a year); - and it should ideally have a range of housing developments and road layouts. Gloucester's bid was successful. **Excluded population/s:** NA **Study year(s):** The GSCP began in 1996 and ran for 5 years until 2001. Baseline data was based on the annual average from 1991 to 1995. **Age of group data collected for:** 15 years and under **Other data collection notes:** Data collected is for the whole of Gloucester.	schemes (engineering measures), education, training and publicity (including courses for offending drivers; presentations and discussion led by County staff on a variety of safety related issues in the Safer City forum, set up as part of the project for the people of Gloucester; local education; special campaigns organised with the police to coincide with national TV advertising; posters; consultation), and enforcement (increased numbers of speed camera sites and use of mobile camera and in-car video equipment) were also part of the package of measures. The focus was however on engineering. **What delivered:** Information on the existing accident problem was used to develop a package of measures aimed at reducing casualties. Local safety schemes were not particularly novel. However, the scale of implementation was much larger than anything tried before. The programme recognised that the measures employed needed to suit local circumstances. The team therefore had to decide what functions particular roads should perform. The team needed to develop the desired hierarchy to decide what measures to apply. This was to a large extent governed by the existing road network. The team decided that there should be three main categories of road within the city. - At the highest level was a network of roads that remain through routes. Although some were lined with houses it was not possible to downgrade them.		**team:** - **Evidence gaps and/or recommendations for future research (as stated by authors):** The authors imply that longer term monitoring of whether parents are actually more willing to allow their children to walk to school as a result of the project would be useful. **Source of funding:** NR. Department for Transport interim report.

		Measures taken on these roads were to reduce traffic speeds and help vulnerable road users. - The next level of road was mixed use. As with through routes, the team would take measures to reduce traffic speed. Unlike main roads, these would include physical measures. Vulnerable road users would, where possible, have a higher priority than on main roads. - The remaining roads were essentially to be access only. Traffic speed would be kept low, through traffic discouraged and vulnerable road users would be a high priority. Where justified, the team would introduce physical engineering measures to maintain low speed. City wide measures included: road narrowing and highlighted signs and boundaries at the gateways (entrances) to the city; anti-skid surfacing at junctions. Measures implemented in specific areas and on specific routes included: road narrowings, vertical deflection (e.g. road humps, tables at junctions), speed cushions, bus and cycle lanes, improved cycle routes, traffic islands, increased size of pedestrian holding areas in centre of road, central ladder hatching, new/modified pedestrian crossings, improved timings at pedestrian crossings, transponders at traffic lights triggering a green phase for buses, widened pavements, introduction of a 20mph speed limit, vehicle activated speed limit signs, signs to draw driver attention to cyclists, advanced warning signs of possible queues, pedestrianised		

		areas created, roads designated to buses and cyclists only, altered entrance geometry at roundabouts, crossing facilities at roundabouts		
Baseline characteristics				
Results				

	Before GSCP			After GSCP				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
All casualties (all)	1	79		1	70		RaR=0.886 (SE 1.178)	0.461[a]
Pedestrian casualties (all)	1	38		1	29		RaR=0.763 (SE 1.280)	0.272[a]
Pedal cyclist casualties (all)	1	19		1	18		RaR=0.947 (SE 1.389)	0.869[a]
All KSI casualties	1	12		1	8		RaR=0.667 (SE 1.578)	0.371[a]
All 'slight' casualties	1	67		1	62		RaR=0.925 (SE 1.193)	0.660[a]

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

'Before' data is the annual average over 5 years (1991-5), 'After' data is for the year 2000.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Grayling T, Hallam K, Graham D, et al. **Year:** 2002 **Title:** Streets ahead; safe and livable streets for children **Aim of study:** To deepen	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** The city of Kingston-upon-Hull. A city with a population of	**Arm No:** 1 **Name:** Before 20mph zones **Type of intervention:** Before intervention	All casualties (all) Pedestrian casualties (all) Pedal cyclist casualties (all)	**Limitations identified by author:** NR **Limitations identified by review team:** Age range of 'children' not specified. It is not clear what the exact dates for data collection

understanding of the relationship between deprivation and child pedestrian casualties and to examine the impact of local and national transport policies. (The section of interest for this review is a case study within the report) **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** +	about a quarter of a million people, in the North East of England, with a relatively high level of deprivation. Three of Hull's 20 electoral wards are among the 100 most deprived in England and all are in the 30 per cent most deprived. **Location:** Urban **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** This study was of 20mph zones implemented in 1996/1997; data were collected for 3 year 'before' and 'after' periods, although it is not clear what the exact dates for data collection were. **Age of group data collected for:** Unclear. Assumed that children are defined as 15 years or under (the age range specified for 'children' in unrelated data presented earlier in the report). **Other data collection notes:** Hull's 20mph zones were noted in study 10279, however, data do not appear to have been analysed for these schemes in that study, presumably because insufficient 'after' data would have been available at that stage. The current study was of 13 of Hull's 20mph zones.	**Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 2 **Name:** After 20mph zones **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** The authors give a generic description of 20mph zones rather than describing exactly what was implemented in Hull: 20mph zones combine the lower speed limit with humps or speed cushions and other changes to the road layout to make them self-enforcing. In Hull they state that: children at local primary schools design the customised signs for each zone.		were. There is at least one calculation where the data reported appears to be incorrect. **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The work was carried out with financial support from the Guild of Experienced Motorists (GEM) and the Ree Jeffreys Road Fund and additional funding from the Polden Puckham Trust and Laing's Charitable Trust.
Method of allocation to intervention/control				
Method of allocation: NA **Study sufficiently powered?** NA				
Baseline characteristics				
Results				

	Before 20mph zones			After 20mph zones				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
All casualties (all)[a]	3	50		3	18		RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)	1	101	[c]	3	18	[a]	RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)	1	76	[c]	3	18	[a]	RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)	3	101	[c]	3	18	[a]	RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)	3	50	[a]	1	116	[c]	RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)	3	50	[a]	1	73	[c]	RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)	3	50	[a]	3	116	[c]	RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)	3	76	[c]	3	18	[a]	RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)[c]	3	76		3	73		RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)[c]	1	101		1	116		RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)[c]	1	101		1	73		RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)[c]	1	76		1	116		RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)[c]	1	76		1	73		RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)[c]	3	101		3	116		RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)[c]	3	101		3	73		RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)[c]	3	76		3	116		RaR=0.360 (SE 1.316)	<0.001[b]
All casualties (all)	3	50	[a]	3	73	[c]	RaR=0.360 (SE 1.316)	<0.001[b]
Pedestrian casualties (all)[a]	3	30		3	9		RaR=0.300 (SE 1.462)	<0.001[b]
Pedal cyclist casualties (all)[a]	3	13		3	4		RaR=0.308 (SE 1.771)	0.029[b]

[a] Data is for 13 zones
[b] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.
[c] TEST

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Gutierrez N, Orenstein MR, Cooper JF, et al. **Year:** 2008 **Title:** Pedestrian and Bicyclist	**Country:** USA, California **Describe country details:** Developed, dominantly privately financed and private-provided	**Arm No:** 1 **Name:** School SR2S areas	Injury accidents involving child pedestrians (all) Injury accidents involving child cyclists (all)	**Limitations identified by author:** Lack of good data (state or school/project level) of changes in volumes of pedestrian, cyclist and vehicle traffic. Rarity of collisions, leading to uncertainty in estimates

Safety Effects of California Safe Routes to School Program **Aim of study:** (Inferred) To evaluate the impact of the California Safe Routes to School program on the safety of child pedestrians and cyclists **Study design:** Non-RCT **Quality score:** + **External validity score:** +	health care system **Setting:** 350 schools (especially elementary schools) and their surrounding areas **Location:** Not indidcated whether mostly urban or urban/rural mix **Selected area(s) / population(s):** Projects (i.e areas) chosen: if they had been funded in the first 3 SR2S funding cycles; if construction improvements had been completed by end of December 2005; if the relevant agency returned a questionnaire with enough information; and if there was no significant overlap of school or collision data. Led to inclusion of 125 of the 570 projects funded to date. **Excluded population/s:** - **Study year(s):** 1998-2005 (8 years). Mean pre-construction period = 283 weeks (5.4 years). Mean post-construction period = 102 weeks (2 years). **Age of group data collected for:** Collision data for children aged 5 to 17 years **Other data collection notes:** Intervention school area boundaries defined around schools using extent of actual construction, intersections within a quarter of the mile of the school gates, street maps, aerial photographs and school attendance boundaries. Control areas were all intersections in the city boundaries that were not	**Type of intervention:** Safe Routes to School **Details of other components of scheme/intervention (if applicable):** Only five broad types of infrastructure could be funded (see 'what delivered') **What delivered:** Most projects were had multiple components: 71% included pavement upgrades or installation; upgrading of intersection crossings, 41%; traffic calming and speed reduction, 21%; traffic signals, 20%; bicycle paths and other facilities, 12%. **Arm No:** 2 **Name:** Control areas **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** -	Fatal or severe injury collision with child cyclist/ped Minor injury or complaint of inj with child cyclist/ped Injury accidents involving child peds or cyclists (age 5-17) Injury accidents involving child peds or cyclists (age 5-12)	of change. Omission of wider safety impacts of SR2S projects, such as near-misses, perceptions of safe travel, and impact amounts of motorised traffic. **Limitations identified by review team:** Main outcome is injury collisions, not number of injuries per se **Evidence gaps and/or recommendations for future research (as stated by authors):** Need for future assessments to include reliaable before and after data on changes in level of traffic, especially to help identify the types of project which are likely to yield the greates afety benefits and the populations/neighbourhoods that most greatly benefit. **Source of funding:** California Department of Transportation (Caltrans)
Method of allocation to intervention/control				
Method of allocation: None; those schools/agencies and areas that applied for SR2S project funds and implemented a scheme **Study sufficiently powered?** NA				

	used to anchor the location of SR2S school areas (NB. Collision data recording system involves locating accidents to the nearest intersection).	**What delivered:** -		

Baseline characteristics

Results

	School SR2S areas			Control areas				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Change in walking/cycling: none								
Injury accidents:								
Injury accidents involving child pedestrians (all)							RaR=0.980	
Injury accidents involving child cyclists (all)							RaR=1.090	
Fatal or severe injury collision with child cyclist/ped							RaR=1.520	
Injury accidents involving child peds or cyclists (age 5-17)							RaR=1.020	

Change in walking/cycling: +10%	
Injury accidents:	
Injury accidents involving child pedestrians (all)	RaR=0.890
Injury accidents involving child cyclists (all)	RaR=0.990
Fatal or severe injury collision with child cyclist/ped	RaR=1.380
Injury accidents involving child peds or cyclists (age 5-17)	RaR=0.930
Change in walking/cycling: +25%	
Injury accidents:	
Injury accidents involving child pedestrians (all)	RaR=0.780
Injury accidents involving child cyclists (all)	RaR=0.870
Fatal or severe injury collision with child cyclist/ped	RaR=1.210
Injury accidents involving child peds or cyclists (age 5-17)	RaR=0.820
Change in walking/cycling: +50%	
Injury accidents:	
Injury accidents involving child pedestrians (all)	RaR=0.650
Injury accidents involving child cyclists (all)	RaR=0.720
Fatal or severe injury collision with child cyclist/ped	RaR=1.010
Injury accidents involving child peds or cyclists (age 5-17)	RaR=0.680

Change in walking/cycling: +100%	
Injury accidents:	
Injury accidents involving child pedestrians (all)	RaR=0.490
Injury accidents involving child cyclists (all)	RaR=0.540
Fatal or severe injury collision with child cyclist/ped	RaR=0.760
Injury accidents involving child peds or cyclists (age 5-17)	RaR=0.510

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Grundy C, Steinbach R, Edwards P, et al. **Year:** 2008 **Title:** 20 mph zones and Road Safety in London: A report to the London Road Safety Unit **Aim of study:** To provide an assessment of the effectiveness and cost effectiveness of 20mph zones on casualty reduction and to identify implications for road safety policy in London.	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** 20mph zones in London. Those included in this study cover an area of 121km{s}2{/s}, and 2006km of roads within London. The size of a 20mph zone (measured by length of road) varies greatly, from a single stretch of road 0.07km to an area covering 37km of roads. The majority of roads included in the zones are	**Arm No:** 1 **Name:** Before 20mph zones **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** -	Casualties All casualties (all) Pedestrian casualties (all) Pedestrian KSI casualties All KSI casualties Collisions All collisions	**Limitations identified by author:** They could not include data on risk exposure. There might have been a change in the amount and modality of traffic associated with the introduction of 20mph zones. There are also potentially roads that have ceased to be 20mph zones, as some traffic calming measures have been removed over the time period of the study. These occurences are relatively rare however. The study was not able to take into account other road safety initiatives that may have occurred during the study period (e.g. safety cameras). Particular

Study design: Uncontrolled B&A **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	minor roads. The majority of areas that are adjacent to 20mph zones are also minor roads, the second largest group being A roads. In the earlier years, most 20mph zones were located in more affluent areas, and in later years they were located in the more deprived areas. Not all 20mph zones were implemented in an area with high casualty rates, some were implemented around schools or areas with the potential for high numbers of casualties. 252 of the zones contain a school and most have one within a 100m. London's pedestrian casualty rates are declining, but remain comparatively high compared to the England average. This may however reflect the higher number of pedestrians in London. **Location:** Urban **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** 399 20mph zones were implemented across London between 1991-2008. Data was collected for the years 1986-2006 for the time series analysis. For the before and after analysis, 3 years of 'before' and 3 years of 'after' data was collected. This was restricted to the 152 zones implemented between 1991-2003, to ensure that enough 'after' data was available. **Age of group data collected for:**	**What delivered:** - **Arm No:** 2 **Name:** After 20mph zones **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** The zones are marked by terminal signs at the entrance and exit of the zone. Depending on the local environment, a range of vertical and horizontal deflections, as well as other measures, may be implemented. Examples of vertical deflections include road humps, raised junctions, and speed cushions. Horizontal deflections include buildouts, chicanes, pinch points and traffic islands. Examples of other engineering measures include gateways, surfacing, and road narrowing. By definition, the design of 20 mph zones can vary, as long as the zones are self-enforcing and in compliance with Traffic Signs and General Directions 2002. Each 20 mph zone is designed individually, taking into account local area	KSI collisions Collisions involving at least 1 pedestrian Collisions involving at least 1 cyclist	care must therefore be taken when interpreting the results for adjacent areas. **Limitations identified by review team:** - **Evidence gaps and/or recommendations for future research (as stated by authors):** Further research is needed on: how traffic calming measures affect exposure (how far different population groups are 'exposed' to the risk of injury); understanding the relationships between road engineering interventions , perceived safety, transport mode choice and exposure to the road environment; and other effects of 20mph zones (including changes in walking and cycling rates), and the potential different effects on different population and road user groups. There is a need to develop robust methodologies for evaluating the implementation of road safety initiatives in ways in ways which account for potential confounders. **Source of funding:** Transport for London (TfL) commissioned the London School of Hygiene and Tropical Medicine to conduct this analysis.

	15 years and under. **Other data collection notes:** A time series regression analysis was used as the main method of analysis - this allowed adjustment for background changes and potential borough level effects. A before and after analysis was also done to see whether this would provide similar results.	characteristics, funding, cost benefit analysis, community needs and public consultation. Individual boroughs are responsible for designing and selecting sites for 20 mph zones. Designs are expected to follow DfT guidelines. **Arm No:** 3 **Name:** Before data for adjacent areas **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Data provided for areas adjacent to 20mph zones. These areas may be subject to other remedial measures. **Arm No:** 4 **Name:** After data for adjacent areas		

		Type of intervention: No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Data provided for areas adjacent to 20mph zones. **Arm No:** 5 **Name:** Before data for 'background' areas **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Data provided for annual background changes.		

		Arm No: 6 **Name:** After data for 'background' areas **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Data provided for annual background changes.		

Baseline characteristics

Results

	Before 20mph zones			After 20mph zones				
	N	K	MEAN	N	K	MEAN	Δ	*P*

Casualties: All casualties (all)	3	3	RaR=0.803	p<0.0001{Calculated using before and after analysis adjusted for background trends on outside roads by calculating a different trend (% change in casualties) for each year using the total number of casualties in the 3y previous compared to the total numbe
Casualties: All casualties (all)			RaR=0.515 (SE 0.033)	[a]
Casualties: All casualties (all)	3	3	RaR=0.534	p<0.0001[b]
All casualties (all)	3	3	RaR=0.716	p<0.0001[c]
Pedestrian casualties (all)	3	3	RaR=0.807	p<0.0001[c]
Pedestrian casualties (all)	3	3	RaR=0.587	p<0.0001[b]
Pedestrian casualties (all)			RaR=0.538 (SE 0.047)	[a]
Pedestrian casualties (all)	3	3	RaR=0.859	p<0.001{Calculated using before and after analysis adjusted for background trends on outside roads by calculating a different trend (% change in casualties) for each year using the total number of casualties in the 3y previous compared to the total number
Pedestrian KSI casualties			RaR=0.561 (SE 0.089)	[a]
Pedestrian KSI casualties	3	3	RaR=0.903	NS[c]
Pedestrian KSI casualties	3	3	RaR=0.888	NS{Calculated using before and after analysis adjusted for background trends on outside roads by calculating a different trend (% change in casualties) for each year using the total number of casualties in the 3y previous compared to the total number in t
Pedestrian KSI casualties	3	3	RaR=0.589	p<0.001[b]
All KSI casualties	3	3	RaR=0.859	p<0.05{Calculated using before and after analysis adjusted for background trends on outside roads by calculating a different trend (% change in casualties) for each year using the total number of casualties in the 3y previous compared to the total number
All KSI casualties	3	3	RaR=0.782	p<0.05[c]

All KSI casualties	3	3	RaR=0.360	p<0.0001[b]
All KSI casualties			RaR=0.498 (SE 0.066)	[a]
Collisions: All collisions			RaR=0.625 (SE 0.030)	[a]
KSI collisions			RaR=0.558 (SE 0.038)	[a]
Collisions involving at least 1 pedestrian			RaR=0.699 (SE 0.034)	[a]
Collisions involving at least 1 cyclist			RaR=0.834 (SE 0.057)	[a]
Casualties: Pedestrian casualties (all)			RaR=0.530 (SE 0.093)	[a]
Casualties: Pedestrian casualties (all)			RaR=0.492 (SE 0.051)	[a]
Casualties: Pedestrian casualties (all)			RaR=0.737 (SE 0.104)	[a]

[a] Calculated using time series regression analysis
[b] Calculated using unadjusted before and after analysis restricted to the 152 zones implemented between 1991 and 2003
[c] Calculated using before and after analysis adjusted for background trends on outside roads by calculating the % change that occurred between two 6 year periods. Restricted to the 152 zones implemented between 1991 and 2003

	Before data for adjacent areas			After data for adjacent areas				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties: All casualties (all)							RaR=0.903 (SE 0.027)	[a]

Pedestrian casualties (all)	RaR=0.947 (SE 0.034)	a
Pedestrian KSI casualties	RaR=1.045 (SE 0.094)	a
All KSI casualties	RaR=0.946 (SE 0.068)	a
Collisions:		
All collisions	RaR=0.926 (SE 0.018)	a
KSI collisions	RaR=0.925 (SE 0.029)	a
Collisions involving at least 1 pedestrian	RaR=0.959 (SE 0.027)	a
Collisions involving at least 1 cyclist	RaR=0.956 (SE 0.036)	a
Casualties:		
Pedestrian casualties (all)	RaR=0.963 (SE 0.063)	a
Casualties:		
Pedestrian casualties (all)	RaR=0.937 (SE 0.053)	a
Casualties:		
Pedestrian casualties (all)	RaR=0.801 (SE 0.060)	a

[a] Calculated using time series regression analysis

	Before data for 'background' areas			After data for 'background' areas				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
All casualties (all)							RaR=0.966 (SE 0.002)	a
Pedestrian casualties (all)							RaR=0.961 (SE 0.002)	a
Pedestrian KSI casualties							RaR=0.939 (SE 0.003)	a
All KSI casualties							RaR=0.948 (SE 0.003)	a

Collisions:	
All collisions	RaR=0.982 (SE 0.001) [a]
KSI collisions	RaR=0.962 (SE 0.002) [a]
Collisions involving at least 1 pedestrian	RaR=0.966 (SE 0.001) [a]
Collisions involving at least 1 cyclist	RaR=0.980 (SE 0.004) [a]
Casualties: Pedestrian casualties (all)	RaR=0.952 (SE 0.002) [a]
Casualties: Pedestrian casualties (all)	RaR=0.972 (SE 0.002) [a]
Casualties: Pedestrian casualties (all)	RaR=0.960 (SE 0.003) [a]

[a] Calculated using time series regression analysis

Estimates produced by the before and after analysis were adjusted to take into account the background changes in casualties on outside roads. Trends on outside roads were calculated using only B roads and unclassified roads that have never been inside, nor adjacent to a 20mph zone; 2 different methods were used for this.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Jones SJ, Lyons RA, John A, Palmer SR. **Year:** 2005 **Title:** Traffic calming policy can reduce inequalities in child pedestrian injuries: database study **Aim of study:** To determine whether area wide traffic calming distribution reflects known inequalities in child pedestrian injury rates. To determine whether	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** Two UK cities, 45 miles apart, with similar total populations (250-300,000), and similar 4-16 year old populations (35-50,000). In City A, 42.9% of electoral divisions were in the most deprived fourth (Townsend range 3.0-9.7),	**Arm No:** 1 **Name:** City A: 1992-1994 **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** -	Pedestrian casualties (all) Casualty rates(Casualty rates are per 1000 4-16 year olds, per 3 years)	**Limitations identified by author:** The phrase 'all else being equal' is particularly significant as injury rate changes could be due to measured or unmeasured confounders. This type of n=2 ecological study suffers from lack of power and the potential for bias due to other simultaneous changes in intervention or control areas. The main weakness of this study was the lack of traffic calming

traffic calming is associated with changes in childhood pedestrian injury rates. **Study design:** Ecological study **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	compared with 23.8% in City B (Townsend range 2.3-11.3) (all data were fitted to the 1998 electoral divisions). The total road length in City A was 733.1km, and in City B, 798.7km. In City A, 61.5% of most deprived children walked to school, compared to 64.2% in City B. Between 1991 and 2001, proportions of households without cars dropped from 37.3% to 29.7% in City A, and from 34.6% to 28.5% in City B. **Location:** Urban **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** Installation of traffic calming measures was mainly from the mid 1990s onwards. A street by street audit of traffic calming was carried out during April and May 2002 in both cities. Three year periods from 1992 to 2000 were used for analysis. **Age of group data collected for:** 4-16 year old children. **Other data collection notes:** A street by street audit of traffic calming was carried out during April and May 2002 in both cities. Traffic calming features audited were speed humps, road narrowings, and road closures. Initially it was intended that traffic calming feature installation dates would be used in a before and after approach. However, this was not possible as the local authorities do not store this data in a readily available format. Also, traffic calming measures have been installed on different roads within the same electoral division over a	**What delivered:** Installation of traffic calming measures was mainly from the mid 1990s onwards. It is unclear what proportion of traffic calming measures had been implemented at this stage, but the assumption we have made is that there was less than for the later time period (1998-2000). **Arm No:** 2 **Name:** City A: 1998-2000 **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** 891 traffic calming features, mainly in the most deprived fourth of the city (71.3%). It is however unclear when these features were implemented. Traffic calming features audited were speed humps, road narrowings, and road closures. The average distance between these features was 0.82km, and the traffic calming density per km road length was 1.22. **Arm No:** 3 **Name:** City B: 1992-1994 **Type of intervention:** Before		installation dates. Other potential biases relate to changing population and environmental exposures between cities, and between deprivation fourths within cities. Population denominators were specific to each time period. Injury rates therefore accounted for population changes. Traffic volumes and speeds may have changed during the study period, but there are no suitable data to assess this possibilty. Exposure to traffic could also have changed, or may have varied considerably between the two cities. The most appropriate analyses could be argued to include only school journey injuries. Generalising these data to all 4-16 year olds and all journeys is not ideal and limits these analyses. The authors also note the limitations of STATS19. **Limitations identified by review team:** - **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The research was partly funded by a grant from the Chief Medical Officer for Wales.

	period of months or years, precluding simple time series analysis. Analyses were based on deprivation fourths because too few events occur within individual electoral divisions.	intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Installation of traffic calming measures was mainly from the mid 1990s onwards. It is unclear what proportion of traffic calming measures had been implemented at this stage, but the assumption we have made is that there was less than for the later time period (1998-2000). **Arm No:** 4 **Name:** City B: 1998-2000 **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** 553 traffic calming features, mainly in the most deprived fourth of the city (48.2%). It is however unclear when these features were implemented. Traffic calming features audited were speed humps, road narrowings, and road closures. The average distance between these features was 1.4km, and the traffic calming density per km road length was 0.69.		

Baseline characteristics

Results

	City A: 1992-1994			City A: 1998-2000				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
Pedestrian casualties (all)	3	345		3	268		RaR=0.777 (SE 1.085)	0.002[a]
Casualty rates	3	6.98		3	4.84		RaR=0.693 (SE 1.807)	0.534[a]

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

	City A: 1992-1994			City B: 1998-2000				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
Pedestrian casualties (all)	3	345		3	201			
Casualty rates	3	6.98		3	5.25			

	City A: 1998-2000			City B: 1998-2000				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
Pedestrian casualties (all)	3	268		3	201			
Casualty rates	3	4.84		3	5.25			

	City B: 1992-1994			City B: 1998-2000				
	N	K	MEAN	N	K	MEAN	Δ	*P*

Casualties:						
Pedestrian casualties (all)	3	224	3	201	RaR=0.897 (SE 1.102)	0.265[a]
Casualty rates	3	6.05	3	5.25	RaR=0.868 (SE 1.816)	0.812[a]

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

The authors note that changes in injury rates were significantly inversely correlated with density of traffic calming features (number of features per km road length; r=-0.769, p=0.026).

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Jones SM & Farmer SA. **Year:** 1993 **Title:** Pedestrian Ramps in Central Milton Keynes: A Case Study **Aim of study:** To examine the effect of pedestrian ramps on accidents; on pedestrian flows, delay, crossing behaviour; on vehicle flows, behaviour, speeds; and on bus journey times. Also, to describe the results of a survey of people's attitudes to, and understanding of, the ramps. **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** + **Method of allocation to intervention/control** **Method of allocation:** NA **Study sufficiently powered?** NA	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** Central Milton Keynes. In order to reach the main shopping centre in Milton Keynes, many of the customers and workers need to cross a dual carriageway road (Midsummer Boulevard) with a poor accident record. The intervention was installed along this road. Midsummer Boulevard carries all the buses serving the shopping centre and much of the private vehicle traffic, as it gives access to carparks. In addition to the shopping centre there is a large entertainments centre and 2 supermarkets together with further parking. Midsummer Boulevard has quite high pedestrian crossing flows - up to about 4,500 pedestrians per hour, mostly in about a 400m stretch of the road. The road is straight with a speed limit of 30mph. It is moderately busy with up to about 1000 vehicles per hour on a weekday,	**Arm No:** 1 **Name:** Before pedestriam ramps **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Dual carriageway road. Most pedestrians cross at 1 of 8 partially covered ways. In between these walkways, railings and other features are used to discourage pedestrians from crossing, however, crossing is still possible. **Arm No:** 2 **Name:** After pedestriam ramps **Type of intervention:** Road/street redesign/engineering-based	Casualties Pedestrian casualties (all)(Accident data were collected for the length of road outside the shopping centre, including an internal junctions, but excluding an external junction and adjacent service roads) Speed Mean speed(Speed is measured in mph. Data were collected using an instrument installed between 2 of the ramps in the offside lane only, on the Tuesday or Wednesday of the survey week, however, mean data obtained using this method weren't recorded. It is unclear exactly how the speed data recorded here was obtained. Data collected for Midsummer Boulevard only.)	**Limitations identified by author:** A possible distorting influence on this comparison of accidents might have been a change in traffic volumes. However, on average, the traffic flows in the 'before' and 'after' periods are similar and should not have distorted the comparison of accidents. In the 3 years before the installation of the ramps, traffic on Midsummer Boulevard increased by about 15%. In the 11 months after it fell by possibly as much as 12%. Another possible problem is that of 'regression to the mean'. It was not possible to test for the likely size of this effect in this study, but the scale of the change in accidents is such that it seems highly unlikely to be due entirely to regression to the mean. **Limitations identified by review team:** - **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The work

	10% of which are buses; and up to about 1,200 vehicles/hour on a Saturday. All of the buses use stops on the road. The road is less than 1km in length. **Location:** Urban **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** The intervention was implemented in September/October 1988. Accident data were collected for 3 years before, between 1985-1988, and 31 months after the intervention, between 1988-1991. Speed data were collected via three surveys: immediately before installation of the ramps ('before' data); immediately after ('after' data), and again about a year later ('follow-up' data). **Age of group data collected for:** 14 years and under. **Other data collection notes:** Vehicle speed data was collected for Midsummer Boulevard only. Accident data were collected for the length of road outside the shopping centre, including an internal junctions, but excluding an external junction and adjacent service roads.	**Details of other components of scheme/intervention (if applicable):** - **What delivered:** A series of 6 pairs of pedestrian ramps installed at intervals along Midsummer Boulevard. Ramps are 5.5m wide and flat-topped. They raise the road level to the level of the kerb. The approach face of the ramp is marked with white triangles, to enhance its visibility to drivers. Each end of the ramp is marked with a white line to emphasise to pedestrians the boundary between the pavement and the ramp, where they should wait for an opportunity to cross. 'Uneven road' warning signs and signs giving a recommended speed of 10mph were placed at either end of the road, and half way along. In addition a red temporary 'RAMP' sign was placed just before each ramp. Ramps were installed at 6 of the 8 partially covered ways; the remaining 2 were only lightly used. In between ramps, railings and other features are used to discourage pedestrians from crossing, however, crossing is still possible. Spacing between the ramps was about 90m. Pedestrians have no legal priority at the ramps. **Arm No:** 3 **Name:** Follow-up of pedestrian ramps **Type of intervention:** Road/street redesign/engineering-based		described in the paper was part of the Department of Transport-funded research programme conducted by the TRL.

		Details of other components of scheme/intervention (if applicable): - **What delivered:** Data was collected 1 year after installation of the interevention, as well as immediately after.		

Baseline characteristics

Results

	Follow-up of pedestrian ramps		
	N	K	MEAN
Speed:			
Mean speed			15

	Before pedestriam ramps			After pedestriam ramps				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
Pedestrian casualties (all)	3	12		2.58	0		RaR=0.047 (SE 4.230)	<0.001[a]
Mean speed			26			13		

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

In the 'before' period there were 63 casualties in total (all ages), and 29 (46%) of these were pedestrians. There were 2 pedestrian casualties during the 'after' period. The authors state that the change was 'highly statistically significant'.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Layfield R, Webster D, Buttress S. **Year:** 2005 **Title:** Pilot home zone schemes: evaluation of Magor Village, Monmouthshire **Aim of study:** The aim of all of the Pilot Home Zone Scheme reports is to assess the effectiveness of pilot home zone schemes in achieving the aim of home zones; to come to a view on the need for additional legislation; and to identify and disseminate good practice. The aim of the home zone schemes pilot programme is to evaluate the potential benefits, particularly with regard to shared road space, of a wide range of home zones in different parts of England and Wales. The principal aim of home zones is to improve quality of life. The main success criteria for this particular homes zone was to: enhance social activities, deter non-essential vehicles and reduce vehicle speeds, increase pedestrian and cycle activity and safety, and improve the environment for residents. The long term goal is to make the whole of Magor a 20mph zone, subject to residents' approval. **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** Magor Village has a population of around 5000. 'Before' interviews with adults residents living in the area revealed that about 22% had children under the age of 17. It lies about 5 miles east of Newport in southern Monmouthshire. There is little direct employment in the village, and so Magor, and the abutting community of Undy (a previously independent village that has since merged with Magor due to residential development), are effectively a dormitory settlement for the nearby towns of Newport, Cardiff and Bristol. The home zone site consists of the historic central core of Magor which is a conservation area. The area is primarily residential with about 60 dwellings, 20 small shops, a church, restaurants and public houses. Magor Village Primary School and an area of open space are nearby, and vehicular access to these is via the home zone.There are 3 off-street public car-parks close to the village centre with a total capacity of about 85 parking spaces. **Location:** Rural **Selected area(s) / population(s):** Over 30 local authorities in England and Wales put forward around 50 schemes for inclusion in the pilot programme. In selection of the pilot schemes priority was given to schemes with: innovative	**Arm No:** 1 **Name:** Before home zone **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** A consortium of local authorities is looking at transport issues in the area (TIGER - Transport in Gwent Economic Region) with the aim of improving transport arrangements along the Cardiff/Newport/Chepstow corridor. As part of this initiative a study of routes and mode of travel to school in Magor and Undy has been carried out. A safer routes to school strategy has been developed. **What delivered:** Before the home zone was constructed 'The Square', which is part of the home zone area, was a large expanse of tarmacadam and traditional cobbles and stone flag paving. **Arm No:** 2 **Name:** After home zone **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** Monmouthshire County Council have held on-going	Casualties All casualties (all) Speed Mean speed(Speed is measured in mph. Speed data were collected using automatic traffic counters using tube detectors. The 'before' measurements were made over 3 weeks, and the 'after' measurements over 2 weeks. 'Before' and 'after' speed measurements were taken at similar times of year and 3 of the 4 locations were the same each time; however speeds were allocated to particular 'speed bins' rather than the actual value being recorded and problems with the equipment under certain circumstances were noted.)	**Limitations identified by author:** Very little can be drawn from the injury accident data because the time periods are so short. Low accident numbers are unlikely to give a statistically significant result. **Limitations identified by review team:** Home zone sites generally had low vehicle flows and few accidents, and therefore changes in accidents were not a primary focus of the intervention. **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The report was produced by TRL Limited under/as part of a contract placed by the DfT. TRL was commissioned by the Charging and Local Transport Division of the DfT to assess the effectiveness of pilot home zone schemes in achieving the aim of home zones.

Study sufficiently powered? NA	ideas, strong support for residents' associations, transferable results and a commitment to complete implementation of the scheme within the study time scale. The working group tried to include a variety of scheme types and geographical areas. The Magor Village scheme was selected as one of the 9 pilot schemes. **Excluded population/s:** NA **Study year(s):** Phases 1, 2 and 3 of the scheme were carried out between June 2001 and July 2002. The 'before' period for injury accident data was 7 years between 1994 - 2001. The 'after' period was 9 months in 2002/3. 'Before' vehicle speed measurements were made over 3 weeks in September/October 2000. 'After' vehicle speed measurements were made for 2 weeks in October 2003. **Age of group data collected for:** Ages of casualties were given individually in most case, so all those aged 15 or under or where identified as a 'child' have been recorded here. **Other data collection notes:** 'Before' and 'after' speed measurements were taken at similar times of year at the same locations each time; however speeds are allocated to particular 'speed bins' rather than the actual value being recorded and problems with the equipment under certain circumstances were noted. Information on road traffic injury accidents was collected using STATS19.	consultation with residents, schools, traders and local members. **What delivered:** Most of the home zone proposals were implemented; these included: Gateway treatments, with 20mph and home zone signing (in English and Welsh) and 20mph roundel road markings, at the entrances; narrowings created by the use of bollards and wider pavements; one-way systems, and no entry to 'The Square' (the main hub of the home zone) from the southern end; road humps (mainly flat-top humps with block paving); 'Stonemaster flags', plants, railings, trees, grassed areas etc. used to environmentally and visually enhance the area; bollards installed between the pavement and the road. A 20mph zone was established at the boundary of the home zone. A large semi-circular build-out was constructed outside a pub to make the route narrower for vehicles. Small playgrounds were also proposed but not implemented because they caused some concern.		
Baseline characteristics				

Results

	Before home zone			After home zone				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Roads within home zone								
Casualties:								
All casualties (all)	7	0		0.75	0			
Roads bordering home zone								
Casualties:								
All casualties (all)	7	1		0.75	0		RaR=3.111 (SE 5.119)	0.317[a]
West of The Square (no measures, just outside home								
Speed:								
Mean speed			25.8			21.9		
Sycamore Terrace (near speed hump)								
Speed:								
Mean speed			16.4			13.9		
North of The Square (near speed hump)								
Speed:								
Mean speed			13.9			12.2		

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Lindqvist K, Timpka T, Schelp L. **Year:** 2001	**Country:** Sweden **Describe country details:** Developed; public health care	**Arm No:** 1 **Name:** Study area before Safe Community program	All casualties (all)	**Limitations identified by author:** The study design had potential shortcomings. Single-pedestrian injuries were classified as traffic injuries and included in the

Title: Evaluation of inter-organizational traffic injury prevention in a WHO safe community **Aim of study:** To examine the effect of a community-based injury prevention programme (the WHO Safe Community Program) on traffic injuries. **Study design:** Non-RCT **Quality score:** + **External validity score:** - Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	system. **Setting:** The WHO Safe Community program in Motala municipality in the western part of Östergötland county in Sweden. The Safe Community program focussed on local neighbourhoods. The authors state that the children and the elderly are the main 'inhabitants' of the local neighbourhood during the daytime, because it is their main dwelling and commuting area. The authors state with regard to the cultural setting, that in Sweden there is a tradition of broad participation in popular movements and collective action; and that in regions characterised by an individualistic culture, a similar outcome for a program based on collective action may require more effort. **Location:** Urban **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** The programme started in 1983, but actual implementation of the interventions took place in 1987-1988, with a 'maintenance-consolidation' phase between 1989-1995 where intervention activities were integrated completely into existing community networks. Evaluation was carried out in 1995-1999. For the purposes of analysis the 'before' period covered 1 year between 1983 and 1984; the 'after' period covered 1 year (the whole of	**Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 2 **Name:** Study area after Safe Community program **Type of intervention:** Combination intervention **Details of other components of scheme/intervention (if applicable):** The first stage of the programme was a community analysis performed to study the local epidemiology of traffic injuries, to follow the economic consequences of injuries, and to analyse the local social structure and values. Stage two involved the programme design and initiation. The goal set for the programme was to reduce the total injury incidence in the municipality by		program. This may lead to difficulties in comparing the results with other studies, which have followed more strictly the ICD definition of traffic injury. It has still to be acknowledged that not all relevant injuries were included in the evaluation. Psychological sequelae, such as post-traumatic stress disorder, were not included in the severity ratings. Also the calculations of odds ratios in a cohort study may be questioned. In the study setting, the incidence of injuries was, however, in the optimal interval (<10%) to avoid overestimations. Finally, to rule their random fluctuations, the study would have ideally been extended to several years before and after the intervention. **Limitations identified by review team:** - **Evidence gaps and/or recommendations for future research (as stated by authors):** Psychological sequelae, such as post-traumatic stress disorder, should be considered in future studies. **Source of funding:** The study was supported by grants from the Swedish National Institute of Public Health, the Swedish MTO program, and Östergötland County Council.

	the year 1989). **Age of group data collected for:** Children aged 15 or under. **Other data collection notes:** -	25% by the year 2000. From the Traffic Safety Council, a task force meeting each month was held, consisting of representatives from the police, schools, parents' organisations, the municipality road maintenance office, and local motor organisations. Education was part of the programme; the focus of which was on teaching traffic rules and safety norms to children and teenagers. These education programmes were organised by voluntary organisations and the police and were aimed at primary and lower secondary school levels. A 1 hour traffic lesson was scheduled every week for all fourth-graders. A bicycling safety programme was initiated in which parents of 5 year olds were able to buy a helmet at a subsidised price, and where bicycle helmet use was promoted among primary school children. Courses were offered for school children to 'shape up your bike'. Combined actions were focussed on specific areas. A child safety seat loan programme was developed as a demonstrator project and a falling prevention programme was composed for the elderly. **What delivered:** The theoretical framework for the programme was based on a participative strategy for community involvement. The programme goals include organisation of a local cross-sectoral action group; reliance on existing local community networks; and continuous tracking of high-risk environments and groups. The focus was on local		

		neighbourhoods, using structural and educational resources in the community itself to increase safety when residents get from one place to another. For structural changes, the task force used two main sources of reference; the Swedish guidelines for urban planning and traffic safety (SCAFT) and an updated geographical inventory of local trouble spots. The focus was on free foot spaces and traffic calming spaces in residential areas. For example, a 'Safe way to school' program to identify and adjust trouble spots was performed with the cooperation of the primary schools and the municipality's planning department, and a 'Cut your garden hedge' initiative was promoted to increase driveway visibility in residential areas. However, measures were also directed towards motor transport spaces, e.g. by improvement in the winter road maintenance. **Arm No:** 3 **Name:** Control area before Safe Community program **Type of intervention:** No intervention **Details of other components of**		

		scheme/intervention (if applicable): - **What delivered:** - **Arm No:** 4 **Name:** Control area after Safe Community program **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** -		
Baseline characteristics				
Results				

	Study area before Safe Community program			Study area after Safe Community program				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties: All casualties (all)	8566	176	(2.1%)	8315	124	(1.5%)		
Casualties: All casualties (all)	4381	114	(2.6%)	4290	79	(1.8%)		
Casualties: All casualties (all)	4185	62	(1.5%)	4025	45	(1.1%)		
Casualties: All casualties (all)	8315			8566			OR=0.722 (SE 1.126)	0.007[a]
Casualties: All casualties (all)	4290			4381			OR=0.702 (SE 1.160)	0.020[a]
Casualties: All casualties (all)	4025			4185			OR=0.752 (SE 1.218)	0.176[a]

[a] chi-square test (Yates's correction) (calculated by reviewer)

	Study area before Safe Community program			Control area after Safe Community program				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties: All casualties (all)	8566	176	(2.1%)	5196	61	(1.2%)		
Casualties: All casualties (all)	4381	114	(2.6%)	2640	34	(1.3%)		
Casualties: All casualties (all)	4185	62	(1.5%)	2556	27	(1.1%)		

	Study area after Safe Community program			Control area after Safe Community program				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties: All casualties (all)	8315	124	(1.5%)	5196	61	(1.2%)		
Casualties: All casualties (all)	4290	79	(1.8%)	2640	34	(1.3%)		
Casualties: All casualties (all)	4025	45	(1.1%)	2556	27	(1.1%)		

	Control area before Safe Community program			Control area after Safe Community program				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties: All casualties (all)	5543	73	(1.3%)	5196	61	(1.2%)		
Casualties: All casualties (all)	2854	43	(1.5%)	2640	34	(1.3%)		
Casualties: All casualties (all)	2689	30	(1.1%)	2556	27	(1.1%)		
Casualties: All casualties (all)	5196			5543			OR=0.890 (SE 1.191)	0.562[a]
Casualties: All casualties (all)	2640			2854			OR=0.853 (SE 1.260)	0.566[a]
Casualties: All casualties (all)	2556			2689			OR=0.946 (SE 1.306)	0.941[a]

[a] chi-square test (Yates's correction) (calculated by reviewer)

The authors state that the age and sex mix in both the study and the control area was stable between the registration periods and was close to the national average; residential and income characteristics also remained stable; the educational level in both areas was slightly below the national average but showed a tendency to increase; the number of motor vehicles owned by residents increased by 12% in the study area and by 13% in the control area. No extraordinary weather conditions were observed during any of the study periods.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Mackie A, Ward H, Walker R. **Year:** 1990 **Title:** Urban Safety Project. 3. Overall evaluation of area wide schemes **Aim of study:** The aims of this report were to assess the overall accident changes achieved by the Urban Safety Project and to present the measured changes in a suitable way to allow broader conclusions and guidelines to be drawn. The main aims of the Urban Safety Project were: to help help the traffic use the main roads more safely; to discourage the use of local residential roads for through travel; and to create safer conditions for the traffic that do have to access the residential roads. **Study design:** Non-RCT	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** A trial of the project was carried out in 5 English towns: Reading, Sheffield, Nelson, Bradford and Bristol. The areas were chosen: to be of average accident risk; to have a range of road network types; to be large enough to show the interaction between main road and residential road traffic redistribution; to be large enough to be able to achieve a statistically significant reduction in accidents (if the target level was reached). The average size of each area was about 7m{s}2{/s}, with residential populations ranging from 30,000 to 50,000. **Location:** Urban **Selected area(s) / population(s):**	**Arm No:** 1 **Name:** Before Urban Safety Project - Study area **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 2 **Name:** After Urban Safety Project -	Injury accidents involving child pedestrians (all) Injury accidents involving child cyclists (all)	**Limitations identified by author:** NR **Limitations identified by review team:** Age range of 'children' not specified. Injury accidents are reported rather than actual numbers of casualties. Dates for data collection and implementation of the schemes are unclear. **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The Urban Safety Project was a collaborative project between the Department of Transport and Local Authorities. The project was managed by the TRRL and monitored jointly by teams from the Transport Studies Group at University College London and the Transport Operations Research Group at the University of Newcastle upon Tyne.

Quality score: + **External validity score:** ++ Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	NA **Excluded population/s:** NA **Study year(s):** Injury accident records were collected in both study and comparison areas for a 5 year 'before' period and a 2 year 'after' period. The exception was in Reading where the 'after' period was only 21 months due to urgent major road works in the area. The actual study years, including year(s) of implementation of the intervention, are unclear. **Age of group data collected for:** NR **Other data collection notes:** It is unclear how accident data were obtained.	study area **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** Schemes were the subject of extensive public consultation and approval by local transport committees. Consultation included an exhibition held at a number of sites in each study area; advertisement in the local press; and leaflets and posters. The information presented included recent accident history of the area, and the safety objectives for each part of it, as well as the measures proposed. Some police enforcement of measures, such as no entry for certain types of vehicle, was required where there were problems with non-compliance. **What delivered:** The Urban Safety Project is a demonstration of the design and application of a strategy to bring together the planning and implementation of road safety measures into a generally applicable management system, covering all parts of the urban network, with the potential to affect all accidents within the area. The strategy involved: better definition of the road hierarchy and redistribution of traffic where roads were not fulfilling their preferred function; reduction in accidents		

		through the redistribution of traffic and safety improvements on selected roads; and improved conditions for vulnerable road users. Some of the safety objectives were to reduce speed by means of traffic calming measures, including: pinch points, entry treatments (e.g. Footway crossovers), central refuges and wide islands, roundabouts, staggered parking bays, rumble strips and speed control bumps. Other measures, used to redistribute traffic, as well as slow traffic down, included: banned right turns; road closures and selective closures; sheltered parking; right-turn bays; and threshold treatments/footway crossovers. Making the approach acceptable to the public often meant shifting the balance between directness of access and safety back in favour of directness of access. This occurred both during the planning and the implementation stages. On average about 10% of the packages of 50 to 60 measures were substantially modified or removed from initially planned schemes. **Arm No:** 3 **Name:** Before Urban Safety Project - control area **Type of intervention:** No		

		intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** A comparison area of similar size and character was chosen for each study area. This was chosen to be as similar as possible to the study area in terms of road network, land use and numbers and types of accidents. Changes in accident numbers in the comparison areas were expected to indicate systematic changes in accidents in the study areas if the schemes had not been implemented. **Arm No:** 4 **Name:** After Urban Safety Project - control area **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** -		

		What delivered: Comparison area		

Baseline characteristics

Results

	Before Urban Safety Project - Study area			After Urban Safety Project - study area				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Injury accidents:								
Injury accidents involving child pedestrians (all)	1	111		1	89		RaR=0.802 (SE 1.153)	0.120[a]
Injury accidents involving child cyclists (all)	1	33		1	22		RaR=0.667 (SE 1.317)	0.138[a]

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

	Before Urban Safety Project - control area			After Urban Safety Project - control area				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Injury accidents:								
Injury accidents involving child pedestrians (all)	1	113		1	96		RaR=0.850 (SE 1.149)	0.240[a]

Injury accidents involving child cyclists (all)	1	33	1	42	RaR=1.273 (SE 1.262)	0.299[a]

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

Speed data were also collected but were not reported in this publication.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Mountain LJ, Hirst WM, Maher MJ. **Year:** 2005 **Title:** Are speed enforcement cameras more effective than other speed management measures? The impact of speed management schemes on 30 mph roads **Aim of study:** To compare the impact of the various types of scheme (speed enforcement cameras and engineering measures) on accidents and vehicle speeds and to establish the nature of any relationship between speed changes and accident changes. **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** 150 speed management schemes implemented on 30mph roads at various locations throughout Great Britain. 30mph roads were selected both because speeding is a significant problem on them and because a wide range of speed management measures are used to enforce 30mph limits. **Location:** NR **Selected area(s) / population(s):** The sample size was limited by the availability of sufficiently detailed before and after speed and flow data as this information is not routinely collected for all speed management schemes. **Excluded population/s:** NA **Study year(s):** Details of all accidents occurring at the schemes during the 3 years prior to scheme implementation and for up to 3 years after implementation (an average after period of 2.5 years) were collected. The dates	**Arm No:** 1 **Name:** Before engineering schemes **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 2 **Name:** After engineering schemes **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** 71 engineering schemes of various types. The authors state that engineering	Injury accidents Injury accidents involving child pedestrians (all)(Only 56 engineering scheme sites and 74 safety camera sites were able to provide child pedestrian accident data. The accident data for engineering schemes included all accidents occurring within the treated section. Similarly, for mobile cameras, the accidents were those occurring within the full section over which the cameras could be deployed as indicated by the relevant police authority. The data for fixed cameras include all available recorded accidents up to 1 km either side of the camera.) Injury accidents involving child cyclists (all)(Only 56 engineering scheme sites and 74 safety camera sites were able to provide child cyclist accident data. The accident data for engineering schemes included all accidents occurring within the treated section. Similarly, for mobile cameras, the accidents were those occurring within the full section over which the cameras could be deployed as indicated by the	**Limitations identified by author:** The observed changes in accidents will, of course, include not only the change attributable to the effect of the speed management schemes on traffic speeds and flows but also changes arising due to regression-to-mean (RTM) and trend. The absence of predictive models for cyclist and pedestrian accidents or data for control sites, meant that it was not possible to correct the observed changes in accidents involving vulnerable road users for RTM effects. **Limitations identified by review team:** Age range of 'children' not specified. The actual dates of data collection are unclear. Numbers of njury accidents are reported rather than actual number of casualties. **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** Financial support was received from the Engineering and Physical Sciences Research Council.

	around which this data was collected are unclear. **Age of group data collected for:** NR **Other data collection notes:** Child specific data were only available for 56/71 engineering scheme sites, and 74/79 safety camera sites. Various local authorities and police forces supplied the data required for the study. The accident data for engineering schemes included all accidents occurring within the treated section. Similarly, for mobile cameras, the accidents were those occurring within the full section over which the cameras could be deployed as indicated by the relevant police authority. The data for fixed cameras in this paper include all available recorded accidents up to 1 km either side of the camera.	schemes were grouped into those which included any form of vertical deflection (with or without narrowing or horizontal deflections) and those with narrowing or horizontal deflections only. They then go on to describe some of the things that these types of scheme include, but don't specify what the schemes analysed in this study include specifically. They also don't split the schemes into these subgroups for reporting any of the child-related outcomes. "Vertical deflections" are said to include any measure that alters the vertical profile of the carriageway such as road humps and speed cushions. "Narrowing", for the purposes of this study, includes any measure used as part of a speed management scheme to reduce the carriageway width available to moving traffic: pinch points, central hatching, traffic islands etc. "Horizontal deflections" are said to include measures that alter the horizontal alignment of the carriageway such as mini-roundabouts, build-outs and chicanes (with either one- or two-wayworking). They also state that four schemes used speed-activated signs to control speeds and one site had 30 mph speed warning roundels painted on the carriageway. There was a total of 31 schemes with horizontal deflections, narrowing or speed-activated signs and 39 schemes with vertical deflections (the scheme with 30 mph speed warning roundels painted on the carriageway was excluded from this analysis of scheme type subgroups).	relevant police authority. The data for fixed cameras include all available recorded accidents up to 1 km either side of the camera.) Speed Mean speed(Speed is measured in mph.)	

		Arm No: 3 **Name:** Before safety cameras **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 4 **Name:** After safety cameras **Type of intervention:** Other type of scheme/intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** 79 speed enforcement cameras (17 mobile and 62 fixed).		
Baseline characteristics				
Results				

	Before engineering schemes			After engineering schemes				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Injury accidents:								
Injury accidents involving child pedestrians (all)[a]	2.98	77		2.54	25		RaR=0.381 (SE 1.259)	<0.001[b]
Injury accidents involving child cyclists (all)[a]	2.98	39		2.54	21		RaR=0.632 (SE 1.311)	0.081[b]
Vertical								
Speed:								
Mean speed	36			36			MD=-8.400 (SE 0.940)	[c]
Horizontal								
Speed:								
Mean speed	30			30			MD=-3.300 (SE 0.530)	[d]

[a] Data is for 56 engineering scheme sites
[b] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.
[c] The authors note that this is significantly different from horizontal and camera schemes (p<0.05)
[d] The authors note that this is significantly different from vertical schemes (p<0.05)

	After engineering schemes			After safety cameras				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Injury accidents:								
Injury accidents involving child pedestrians (all)	2.54	25	[a]	2.42	94	[b]		
Injury accidents involving child cyclists (all)	2.54	21	[a]	2.42	39	[b]		

[a] Data is for 56 engineering scheme sites
[b] Data is for 74 safety camera sites

	Before safety cameras			After safety cameras				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Injury accidents:								
Injury accidents involving child pedestrians (all)[a]	2.99	134		2.42	94		RaR=0.867 (SE 1.144)	0.284[b]
Injury accidents involving child cyclists (all)[a]	2.99	49		2.42	39		RaR=0.983 (SE 1.239)	0.938[b]
Mean speed	74			74			MD=-4.100 (SE 0.320)	[c]

[a] Data is for 74 safety camera sites
[b] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

[c] The authors note that this is significantly different from vertical schemes (p<0.05) N = number of sites for speed data.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Tester JM, Rutherford GW, Wald Z, Rutherford MW. **Year:** 2004 **Title:** A matched case-control study evaluating the effectiveness of speed humps in reducing child pedestrian injuries **Aim of study:** To determine whether children who had been struck by automobiles in Oakland were any less likely to live near a speed hump than their peers who lived in the same city boundaries but visited the emergency room that day for a reason other than being hit by a car. **Study design:** Matched case-control study **Quality score:** + **External validity score:** - *Method of allocation to intervention/control* **Method of allocation:** NA **Study sufficiently powered?** NA	**Country:** US (California) **Describe country details:** Developed; private health care system **Setting:** The Oakland Pedestrian Safety Project. Oakland has historically been one of the most dangerous cities in California to be a pedestrian. The intervention was implemented on residential streets. **Location:** Urban **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** Over a 5 year period between 1995 and 2000, Oakland installed about 1600 speed humps. Data was also collected between these years. **Age of group data collected for:** 14 and under; also suggest that children under 5 years were excluded because injuries in this age group were not usually related to the flow of street traffic (although this is unclear) **Other data collection notes:** Data from the Department of Traffic Engineering in Oakland were used to determine the exact locations and dates of installation of speed humps.	**Arm No:** 1 **Name:** Case **N:** 100 **Description of arm:** Case patients were children who were seen in the emergency department at Children's Hospital Oakland after having been struck and injured by an automobile on a residential street. The hospital receives all paediatric ambulance trauma transports (including deaths on the scene) from the city of Oakland, and therefore child pedestrians injured in Oakland were targeted. Children also had to be residents of the city of Oakland. Case patients were identified retrospectively from a trauma database using International Classification of Diseases (9th Revision) E-code E814.7 (motor vehicle traffic accident involving collision with a pedestrian). Charts and emergency medical service data sheets were reviewed to eliminate parking lot injuries, injuries involving cyclists who had been mis-classified as pedestrians, and driveway rollover collisions. In addition, traffic report data from the Oakland Police Department were also reviewed, primarily to confirm locations of collisions; and when necessary original traffic reports	**Casualties** Pedestrian casualties (all)	**Limitations identified by author:** The authors note several methodological limitations: Limiting measurement to speed humps on a child's street ignores the potential protective effect of speed humps around the corner from a child's house. Thus, by measuring speed humps lateral to an index street (rather than in a 1-block radius), they may have underestimated the relevant rate of exposure to this intervention, which would have affected their estimation of the intervention's protective impact. Study sample. While relying on emergency department visits ensured that they incorporated higher severity injuries (including deaths), injuries that were not reported to the emergency medical services (and for which children may have been taken by their family to their regular doctor) would have been missed. This would mean that their sample underrepresented lower acuity injuries. It is also possible that their sample underrepresented younger children, in that children younger than 5 years are more likely to be hit in their driveway; they excluded children in this age group from their study because such injuries are not

		were reviewed for further clarification. Analysis was restricted to children injured or killed within 0.25 miles of home, and these children were split into those that were injured on an 'index street' (on the street block of the child's residence), and those that were injured in the 'surrounding neighbourhood' (within a 0.25 mile radius, which equated to about 5 blocks), or at a more distant location within Oakland. Only children residing on minor roads (residential streets) were eligible because speed humps are only installed on such roads. **Arm No:** 2 **Name:** Control **N:** 200 **Description of arm:** Two controls, seen in the emergency department that same day for a reason other than being hit by a car, were matched with regard to age, gender and date of emergency department visit, to each case patient. Eligible control patients were identified from the daily log and randomly selected. In situations where there were fewer than 2 eligible controls available, the investigators searched 1 year above or below the age of the case patient, and then 2 years above or below and so on until a suitable control was identified. 93% of all controls were within 2 years of age of their respective case patients. Controls were again restricted to Oakland residents living on residential streets **Type of intervention:** Road/street		related to the flow of street traffic. Finally, it is possible that significant confounding factors were not addressed in this study. They would have liked to control for the presence of sidewalks, but there were no reliable retrospective data on sidewalk or curb presence available to do so. Also, since much of the earlier literature points to lower SES as a risk factor for child pedestrian injury, the reason for their inability to reproduce this relationship may have been that the factors they used to approximate SES – census tract household income and medical insurance status – were inappropriate proxies for SES. **Limitations identified by review team:** **Evidence gaps and/or recommendations for future research (as stated by authors):** The authors state that the findings from their study invite additional research on the protective effects of traffic calming interventions and offer a framework for studying pedestrian injuries in relation to physical interventions implemented within a localised geographic region. Further confirmation of the protective effects of speed humps would be useful and could be augmented by additional information on stop signs or other factors that would affect slowing distances on either side of a speed hump. **Source of funding:** NR

		redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** **What delivered:** The Oakland Pedestrian Safety Project was a multidisciplinary alliance addressing child and senior pedestrian injuries in Oakland and advocated for installation of speed humps.		

Baseline characteristics

Case patients and controls were similar in terms of age, gender, insurance status, median household income, and proportion with an underlying premorbid neurodevelopmental disease. Case patients were more likely to be Asian or of Hispanic ethnicity. The odds of an Asian child having been involved in an accident was 5.8 times as high as that for a white child (*p*=0.018), and the odds of a Latino child having been involved were 4.3 times as high (*p*=0.038).

Results

	Case Patients (n=100), No. (%)	Control Patients (n=200), No. (%)	OR (95% CI)[a]	Adjusted OR (95% CI)[b]
Neighbourhood injury	14(14)	46(23)	0.50(0.27,0.89)	0.47(0.24,0.95)
Index street injury[c]	6(12)	24(24)	0.38(0.15,0.90)	0.40(0.15,1.06)

Calculated from McNemar matched pairs analysis.

[b] Calculated from multivariate model including ethnicity.

[c] Among the 100 case patients, 49 were actually hit on a block in front of their home.

Unadjusted odds ratios were derived using a matched pairs analysis. Adjusted odds ratios were calculated after controlling for race and ethnicity by performing multivariate logistic regression analyses using both predictor variables and including race and ethnicity in the model.

Study details	Population and setting	Arms	OUTCOMES	Notes

Author(s): Tilly A, Webster D, Buttress S. **Year:** 2005 **Title:** Pilot home zone schemes: evaluation of Northmoor, Manchester **Aim of study:** The aim of all of the Pilot Home Zone Scheme reports is to assess the effectiveness of pilot home zone schemes in achieving the aim of home zones; to come to a view on the need for additional legislation; and to identify and disseminate good practice. The aim of the home zone schemes pilot programme is to evaluate the potential benefits, particularly with regard to shared road space, of a wide range of home zones in different parts of England and Wales. The principal aim of home zones is to improve quality of life. The main success criteria for this particular homes zone was to: restrict traffic movement and speeds in the home zone to improve safety and reduce traffic noise and pollution; impede movement through the area to discourage those escaping from the police and traffic congestion; improve pedestrian safety, particularly elderly people and children travelling to school; design for structured car-parking; improve the overall appearance of the streets; provide new open spaces, particularly for seating and play; improve street lighting to deter crime and improve community safety. **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** +	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** Manchester has a number of regeneration programmes throughout the city, including the A6 Stockport Road Corridor Single Regeneration Budget initiative. Northmoor, which lies at the heart of this initiative area was declared a Housing Renewal Area in December 1998 and attracts funding from the Housing Investment Programme, Capital Receipts, Local Transport Funding and others. The Northmoor home zone forms an essential part of the concept plan and will integrate with a range of projects. Northmoor is a well-defined residential area containing about 1400 dwellings. Northmoor Road is the main spine road through the home zone and has been used as a 'racetrack' for stolen cars and as a 'rat-run' by vehicles avoiding congestion on the A6 Stockport Road. The decline of Northmoor was the result of a combination of environmental, social and economic factors (e.g. high levels of unemployment, increasing drug use and vandalism, a deteriorating physical environment). Children up to 15 years old make up a relatively high proportion of the population (27%). The residential streets are quite repetitive, with made up surfaces and no soft landscaping; houses have no front gardens; small children tend to play in the streets; car ownership is low; and crime is a problem in the area.	**Arm No:** 1 **Name:** Before home zone **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Northmoor Road has been subject to some traffic calming measures including a single-way working chicane, low thermoplastic humps 'thumps' and speed cushions. **Arm No:** 2 **Name:** After home zone **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** On-going consultation with residents, the local authority, the housing association and the design team. A newsletter was also circulated to keep people in touch with the progress of the scheme. A home zone fun day was organised with a home zone mock-up on a street that was closed for the day **What delivered:** Home zone measures included: introducing 'green streets' between parallel streets (the use of open spaces created by demolition of some properties); introducing particular	Casualties Pedal cyclist 'slight' casualties All casualties (all) Pedestrian KSI casualties Pedal cyclist KSI casualties Pedestrian 'slight' casualties Speed Mean speed(Speed is measured in mph. Speed data were collected using automatic traffic counters using tube detectors. The 'before' measurements were made over 3 weeks, and the 'after' measurements over 2 weeks. 'Before' and 'after' speed measurements were taken at similar times of year at the same locations each time; however speeds were allocated to particular 'speed bins' rather than the actual value being recorded and problems with the equipment under certain circumstances were noted.)	**Limitations identified by author:** Very little can be drawn from the injury accident data because the time periods are so short. Low accident numbers are unlikely to give a statistically significant result. **Limitations identified by review team:** Home zone sites generally had low vehicle flows and few accidents, and therefore changes in accidents were not a primary focus of the intervention. **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The report was produced by TRL Limited under/as part of a contract placed by the DfT. TRL was commissioned by the Charging and Local Transport Division of the DfT to assess the effectiveness of pilot home zone schemes in achieving the aim of home zones.

Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	**Location:** Urban **Selected area(s) / population(s):** Over 30 local authorities in England and Wales put forward around 50 schemes for inclusion in the pilot programme. In selection of the pilot schemes priority was given to schemes with: innovative ideas, strong support for residents' associations, transferable results and a commitment to complete implementation of the scheme within the study time scale. The working group tried to include a variety of scheme types and geographical areas. The Northmoor scheme was selected as one of the 9 pilot schemes. **Excluded population/s:** NA **Study year(s):** Installation of Phase 1 of the scheme (evaluated in this report) was carried out in 2001. The 'before' period for injury accident data was 5 years between 1995 - 2000. The 'after' period was just less than 2 years between 2001 - 2003. 'Before' vehicle speed measurements were made over 3 weeks in June/July 2000. 'After' vehicle speed measurements were made for 2 weeks in July 2003. **Age of group data collected for:** Ages of casualties were given individually in most case, so all those aged 15 or under or where identified as a 'child' have been recorded here. **Other data collection notes:** 'Before' and 'after' speed measurements were taken at similar times of year at the same locations each time; however speeds are allocated to particular 'speed bins' rather than the actual value being recorded and problems	features such as small gardens and wall mounted pots outside houses; planting trees in the streets; renewing and upgrading street lights; replacing parallel parking with echelon parking on alternate sides of the road; and slowing vehicular traffic. There is a gateway at the entrance to each home zone street with a specially designed home zone entry sign and a block paving effect to alert drivers to the different type of area they are entering. There is a 'shared' surface along each of the four home zone streets. Vehicles travelling along the shared surface have to negotiate various features that they perhaps wouldn't encounter on a 'conventional' street, such as parked vehicles in designated angled parking bays, as well as any vehicles parked in undesignated parking areas; large public art 'globes' which form chicanes etc. Although the home zone concept has a shared vehicular/pedestrian surface, many residents expressed concern about it, and as a result different surfaces were applied to vehicle routes and non-vehicular routes, making it appear that the narrow footpath is retained, when in fact it is all one shared surface.		

	with the equipment under certain circumstances were noted. Information on road traffic injury accidents was collected using STATS19.			

Baseline characteristics

Results

	Before home zone			After home zone				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Roads within home zone								
Casualties:								
Pedal cyclist 'slight' casualties	5	0		1.92	0			
All casualties (all)	5	3		1.92	1		RaR=0.868 (SE 3.173)	0.899[a]
Pedestrian KSI casualties	5	0		1.92	0			
Pedal cyclist KSI casualties	5	0		1.92	0			
Pedestrian 'slight' casualties	5	3		1.92	1			
Stainer Street (treated)								
Speed:								
Mean speed						9.4		
Rushford Street (untreated)								
Speed:								
Mean speed			17.5			17.9		
Purcell Street (treated)								
Speed:								
Mean speed			17.4			11.5		
Prout Street (treated)								
Speed:								
Mean speed			16			12.6		
Northmoor Road (low height humps and cushions)								
Speed:								
Mean speed			14.7			17.9		

Roads bordering home zone						
Casualties:						
Pedal cyclist 'slight' casualties	5	3	1.92	1		
All casualties (all)	5	5	1.92	1	RaR=0.710 (SE 2.991)	0.485[a]
Pedestrian KSI casualties	5	0	1.92	0		
Pedal cyclist KSI casualties	5	0	1.92	0		
Pedestrian 'slight' casualties	5	2	1.92	0		

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

'Before' speed data wasn't collected for Stainer Street, and no speed data was reported for Barnby Street.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): von Kries R, Kohne C, Bohm O, von Voss H. **Year:** 1998 **Title:** Road injuries in school age children: relation to environmental factors amenable to interventions **Aim of study:** To assess the impact of potentially modifiable environmental factors on the risk for pedestrian and cyclist injuries among school age children in Düsseldorf. **Study design:** Case control study **Quality score:** + **External validity score:** - Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	**Country:** Germany **Describe country details:** Developed; **Setting:** Population of school age children in Düsseldorf (population 570,000) in the west of Germany. **Location:** Urban **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** Data for analysis was collected for the period between January 1993 and March 1995. **Age of group data collected for:** Children between the ages of 6 and 14 years. **Other data collection notes:** -	**Description of cases** **N:** 170 Criteria for inclusion of cases were: residence in Düsseldorf, and an injury within 500m from home. **Description of controls** **N:** 168 Controls were matched to cases by age and sex, and also resident in Düsseldorf. They were randomly selected from a list of all school age children **Arm No:** 1 **Name:** 0-5 30kph streets **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** -	All casualties (all)(N.B. All casualties here includes pedestrian and cyclist casualties only. Casualties were those recorded by police, and included only those which they were called to.)	**Limitations identified by author:** A bias towards unity is possible due to imprecision from two potential sources: the house number was only given as a range of 5 consecutive house numbers. The exact place of the children's homes therefore could not be identified, leaving some room for random misclassification of the neighbourhood areas. Three students carried out the fieldwork, each of whom was thoroughly trained. Nevertheless, some misclassification can not be excluded. As the students were blind to the identity of cases and controls during data collection, this can only have resulted in random misclassification. In this study they could not control for socioeconomic factors because individual access to the children was not possible due to data protection rules in Germany. Furthermore, the traffic volume could not be measured. It is not clear which components of the possible interventions are most

		What delivered: - **Arm No:** 2 **Name:** 6-10 30kph streets **Type of intervention:** - **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 3 **Name:** 11-15 30kph streets **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 4 **Name:** >15 30kph streets **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** -		relevant. For example on a street with a speed limit of 30kph drivers almost never have priority at street junctions. Priority must be given to vehicles coming from the right. This alone may cause drivers to drive slowly. **Limitations identified by review team:** - **Evidence gaps and/or recommendations for future research (as stated by authors):** For decision making in traffic planning it might be important to disentangle the effects of the speed limit and priority regulations in order to decide whether additional speed limits are needed for specific streets. An extension of this study in close cooperation with experts on traffic planning should be the next step in defining the most important measures needed to make the street environment safer for children. **Source of funding:** This study was a project of the 'Forschungsverbund Public Health, NRW' supported by the BMFT.

		Arm No: 5 **Name:** 0-1 pelican crossings/street **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 6 **Name:** >1-2 pelican crossings/street **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** - **Arm No:** 7 **Name:** >2-3 pelican crossings/street **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if		

		applicable): - **What delivered:** - **Arm No:** 8 **Name:** >3 pelican crossings/street **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** -		

Baseline characteristics

Results

	0-5 30kph streets			>15 30kph streets				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
All casualties (all)							OR=5.300 (SE 1.842)	[a]

[a] Calculations were with "conditional logistic regression" (SAS: PROC PHREG) with mathcing variable age and sex (170 cases and 168 controls)

	6-10 30kph streets			>15 30kph streets				
	N	K	MEAN	N	K	MEAN	Δ	*P*

Casualties: All casualties (all)							OR=4.300 (SE 1.786)	[a]

[a] Calculations were with "conditional logistic regression" (SAS: PROC PHREG) with mathcing variable age and sex (170 cases and 168 controls)

	11-15 30kph streets			>15 30kph streets				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties: All casualties (all)							OR=2.500 (SE 1.824)	[a]

[a] Calculations were with "conditional logistic regression" (SAS: PROC PHREG) with mathcing variable age and sex (170 cases and 168 controls)

	0-1 pelican crossings/street			>3 pelican crossings/street				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties: All casualties (all)							OR=2.300 (SE 1.406)	[a]

[a] Calculations were with "conditional logistic regression" (SAS: PROC PHREG) with mathcing variable age and sex (170 cases and 168 controls)

	>1-2 pelican crossings/street			>3 pelican crossings/street				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties: All casualties (all)							OR=2.400 (SE 1.351)	[a]

[a] Calculations were with "conditional logistic regression" (SAS: PROC PHREG) with mathcing variable age and sex (170 cases and 168 controls)

	>2-3 pelican crossings/street			>3 pelican crossings/street				
	N	K	MEAN	N	K	MEAN	Δ	*P*

Casualties:		
All casualties (all)	OR=1.100 (SE 1.329)	[a]

[a] Calculations were with "conditional logistic regression" (SAS: PROC PHREG) with mathcing variable age and sex (170 cases and 168 controls)

To assess the risk associated with fewer streets with a speed limit of 30kph, the number of the streets were categorised (5 streets/category) and the risk for each category compared with a base category of 15 or more streets. Similar categories were developed for mean number of pelican crossings/street, where the risk for each category was compared with a base category of >3 crossings/street; and mean number of playgrounds, where the risk for each category was compared with a base category of >3 playgrounds.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Webster D, Tilly A, Buttress S. **Year:** 2005 **Title:** Pilot home zone schemes: evaluation of Cavell Way, Sittingbourne **Aim of study:** The aim of all of the Pilot Home Zone Scheme reports is to assess the effectiveness of pilot home zone schemes in achieving the aim of home zones; to come to a view on the need for additional legislation; and to identify and disseminate good practice. The aim of the home zone schemes pilot programme is to evaluate the potential benefits, particularly with regard to shared road space, of a wide range of home zones in different parts of England and Wales. The principal aim of home zones is to improve quality of life. The main success criteria for this particular local authority were: Has the Home Zone scheme improved the quality of life of the area - how do	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** Cavell Way, Sittingbourne. The Cavell Way home zone is a 'retro fit' home zone (a home zone being introduced to an existing housing estate). The Cavell Way housing development was constructed in 1993. It is a clearly definable area with distinct boundaries. There is only one road providing access into and out of the estate. It consists of 122 family dwellings, made up mostly of terraced family town houses with some flats and a few semi-detached houses. There are a mixture of age groups that live there, although there is a relatively high proportion of children. The housing estate is in a pocket of relative deprivation, within a wider more affluent area. It borders directly onto a Single Regeneration Budget area. There is a play area located within the area. The Cavell Way Residents Association had	**Arm No:** 1 **Name:** Before home zone **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Limited traffic calming, including 3 road humps, was already present before the home zone was implemented. The distance was about 170m between the first two humps, and 80 metres between the second and third humps. **Arm No:** 2 **Name:** After home zone **Type of intervention:** Road/street redesign/engineering-based	Injury accidents Injury accidents involving children(Accident data includes accidents within the home zone or on a road within 15m of the junction with the home zone.) Speed Mean speed(Speed is measured in mph. Speed data were collected using automatic traffic counters using permanent loop detectors. The 'before' measurements were made over 3 weeks, but it is unclear what time period the 'after' measurements were taken over. 'Before' and 'after' speed measurements were taken at different times of year and 2 locations were the same each time (another 2 locations were added for the 'after' data). Speeds were allocated to particular 'speed bins' rather than the actual value being recorded and problems with the equipment under certain circumstances were noted.)	**Limitations identified by author:** Very little can be drawn from the injury accident data because the time periods are so short. Low accident numbers are unlikely to give a statistically significant result. **Limitations identified by review team:** Home zone sites generally had low vehicle flows and few accidents, and therefore changes in accidents were not a primary focus of the intervention. **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The report was produced by TRL Limited under/as part of a contract placed by the DfT. TRL was commissioned by the Charging and Local Transport Division of the DfT to assess the effectiveness of pilot home zone schemes in achieving the aim of home zones.

residents feel about their street? Has it changed the use or ease of use of the area by pedestrians? Has it changed the activities of the community? Has there been a reduction in speed and an improvement in perceived safety? **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	been after a home zone type scheme for some time before implementation due to tha concern for the safety and security of children walking or cycling alone along the streets. **Location:** Rural **Selected area(s) / population(s):** Over 30 local authorities in England and Wales put forward around 50 schemes for inclusion in the pilot programme. In selection of the pilot schemes priority was given to schemes with: innovative ideas, strong support for residents' associations, transferable results and a commitment to complete implementation of the scheme within the study time scale. The working group tried to include a variety of scheme types and geographical areas. The Cavell Way scheme was selected as one of the 9 pilot schemes. **Excluded population/s:** NA **Study year(s):** The first phase of the scheme was implemented in October 2000, the second phase from May to July 2001, and the third phase started in August 2002 and was completed in April 2003. The 'before' period for injury accident data was 5 years between 1995 -1999. The 'after' period was 5 months in 2003. 'Before' vehicle speed measurements were made over 3 weeks in May/June 2000. 'After' vehicle speed measurements were made in September/October 2003 (time periods for collection are unclear). **Age of group data collected for:** Ages of casualties were given individually in most case, so all those aged 15 or under or where	**Details of other components of scheme/intervention (if applicable):** Consultation, including a street party; a visit to Holland for 5 residents, including a child, to experience a Dutch home zone; and a 'planning for real' event. Continual vandalism of certain areas led to installation of a mobile CCTV camera in the planting area, which was successful in deterring vandalism. **What delivered:** During the first phase of the work an entry gateway was constructed, where the road width was made narrower using low planters, landscaping and a home zone entry sign designed by local children (as this was a non-statutory sign, it was later replaced by authorised signs). During the second phase changes were made to the priority of the junction at the spur cul-de-sac, including the whole junction being raised to pavement level; extra seating was also provided, adjacent to the area with planting and links to the play area. The third phase was built on the idea of a central shared surface area formed by a new road alignment to maintain slow traffic. 2 of the 3 existing flat-top humps were retained (the other was incorporated into the shared surface area), and a chicane was also constructed between an existing flat-top hump and the spur cul-de-sac.		

	identified as a 'child' have been recorded here. **Other data collection notes:** 'Before' and 'after' speed measurements were taken at 2 of the same locations each time but were not taken at the same time of year (May/June and September/October respectively). Speeds are allocated to particular 'speed bins' rather than the actual value being recorded and problems with the equipment under certain circumstances were noted. Information on road traffic injury accidents was collected using STATS19.			
Baseline characteristics				
Results				

	Before home zone			After home zone				
	N	K	MEAN	N	K	MEAN	Δ	P
Injury accidents:								
Injury accidents involving children	5	0		0.42	0	[a]		
Mean speed			21.1[b]			13.4[c]	MD=-7.700	[d]

[a] 'After accident data are preliminary data only and weren't yet validated by Kent County Council.
[b] 'Before' speed data was only collected for 2 of the sites.
[c] 'After' speed data are overall data for all 4 locations.
[d] Speed 'change' data are overall data for all 4 locations, calculated from the average 'before' and 'after' data for each of the locations; however, 'before' data wasn't collected for 2 of the sites.

Accident data included accidents within the homezone and also on another road up to 15m from the Cavell Way junction.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Webster DC & Layfield RE. **Year:** 2003 **Title:** Review of 20mph zones in London Boroughs **Aim of study:** To review the performance of 20mph zones in London **Study design:** Non-RCT **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** London Boroughs **Location:** Urban **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** Data collected retrospectively in 2003; schemes implemented from 1989 onwards. Data was collected for a 5 year 'before' period that finished before the traffic calming or first phases were installed. The start of each 'after' period was taken as the first complete month after the 20mph zone was completed. The maximum length was 5 years and the minimum length was 1 year. **Age of group data collected for:** NR **Other data collection notes:** This study includes data for five of the 20mphs zones in London that were also included in the study 10279. Data were extracted from these two studies separately, but there is some overlap between the two. Detailed information was obtained from the London Boroughs for 115 of the 137 zones identified,	**Arm No:** 1 **Name:** Before 20mph Zones **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** NA **What delivered:** It was believed that roads were originally subject to a 30mph speed limit. **Arm No:** 2 **Name:** After 20mph Zones **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** NA **What delivered:** 20mph zones.	Casualties All casualties (all) Pedestrian casualties (all) Pedestrian KSI casualties Pedal cyclist casualties (all) Pedal cyclist KSI casualties Car occupant casualties (all) Car occupant KSI casualties All KSI casualties Speed Mean speed(Speed is measured in mph.)	**Limitations identified by author:** Insufficient data readily available with regard to scheme costs, scheme design, traffic flows, and speeds before and after installation, by road user type in order to identify any relationships between zone design and effectiveness. **Limitations identified by review team:** Age range of 'children' not specified. There is at least one calculation where the data reported appears to be incorrect. **Evidence gaps and/or recommendations for future research (as stated by authors):** It is recommended that: further work is undertaken to assess the potential benefit of more extensive use of 20mph zones; future schemes are more fully monitored and analysed, preferably in a comprehensive way, in order to better understand good practice; an in depth study into the effect of 20mph zones on powered two-wheelers be undertaken. The authors also state that: 'The finding that the 20mph zone roads had the highest accident frequencies per km before installation needs to be explored further. We need to try and understand why the sites were chosen. Compared with the non-20mph zone roads, were the higher rates on the study roads due to choosing 20mph zone installations to be on roads with:

	however only 78 of these had been in place long enough for at least 1 year of 'after' accident data to be available for analysis. Change in speed data was only available for 14/78 zones.	102 of the 115 (89%) were 'area' zones, 13 (11%) were 'linear' zones (only one road). 40 (35%) were purely residential zones, 70 (61%) contained schools and 5 (4%) were town/city centres or mainly commercial zones. Types of traffic calming measures used: road humps (flat-top and round-top), raised junctions, speed cushions, chicanes, raised footway. Spacing of measures (available for 74 (64%) zones): average 'minimum' spacing was about 49m, average 'maximum' spacing was about 94m. Length of roads (comprising one zone): maximum = 14.5km, minimum = 0.15km. The average length of road in each zone was 3.4km. Size of schemes: the average size of all the zones was 0.35km{s}2{/s}. **Arm No:** 3 **Name:** Before data for unclassified roads in London **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Used to adjust for		more traffic?; more vulnerable road users?; higher speeds?; higher speed differentials between road users?; higher junction densities?; poorer designs?; adverse road geometric characteristics?; different road user behavioural factors?; adverse social deprivation factors?; different types of land use? These types of questions should be tackled in order to assess whether the reductions observed in the current study are likely to be achievable on the remaining 97% of London's unclassified roads? And, if not, to what extent would lower reductions be cost-effective?' **Source of funding:** TRL were commissioned by the London Accident Analysis Unit (LAAU).

		general underlying changes in casualty frequency on unclassified roads within London during the time covered by the 'before' and 'after' periods. **Arm No:** 4 **Name:** After data for unclassified roads in London **Type of intervention:** No intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Used to adjust for general underlying changes in casualty frequency on unclassified roads within London during the during the time covered by the 'before' and 'after' periods.		
Baseline characteristics				

Results

	Before 20mph Zones			After 20mph Zones				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
All casualties (all)[a]	5	475		3.13	146		RaR=0.491 (SE 1.099)	<0.001[b]
Pedestrian casualties (all)[a]	5	291		3.13	94		RaR=0.516 (SE 1.126)	<0.001[b]
Pedestrian KSI casualties[a]	5	73		3.13	18		RaR=0.394 (SE 1.301)	<0.001[b]
Pedal cyclist casualties (all)[a]	5	97		3.13	25		RaR=0.412 (SE 1.251)	<0.001[b]
Pedal cyclist KSI casualties[a]	5	16		3.13	4		RaR=0.399 (SE 1.749)	0.060[b]
Car occupant casualties (all)[a]	5	75		3.13	23		RaR=0.490 (SE 1.269)	<0.001[b]
Car occupant KSI casualties[a]	5	3		3.13	1		RaR=0.532 (SE 3.173)	0.552[b]
All KSI casualties[a]	5	95		3.13	24		RaR=0.404 (SE 1.257)	<0.001[b]
Speed:								
Mean speed	14			14			MD=-9.100	

[a] Data is for 78 zones

[b] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

	After 20mph Zones			After data for unclassified roads in London				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
All casualties (all)[a]	3.13	146		3	3926			
Pedestrian casualties (all)	3.13	94	[a]					
Pedestrian KSI casualties	3.13	18	[a]					
Pedal cyclist casualties (all)	3.13	25	[a]					
Pedal cyclist KSI casualties	3.13	4	[a]					
Car occupant casualties (all)	3.13	23	[a]					
Car occupant KSI casualties	3.13	1	[a]					
All KSI casualties[a]	3.13	24		3	650			
All casualties (all)	3			3.13			RaR=0.036 (SE 1.088)	<0.001[b]
All KSI casualties	3			3.13			RaR=0.035 (SE 1.231)	<0.001[b]

[a] Data is for 78 zones

[b] MLE (calculated by reviewer)

	Before data for unclassified roads in London			After data for unclassified roads in London				
	N	K	MEAN	N	K	MEAN	Δ	*P*

Casualties:						
All casualties (all)[a]	5	7718	3	3926	RaR=0.848 (SE 1.020)	<0.001[b]
All KSI casualties[a]	5	1486	3	650	RaR=0.729 (SE 1.048)	<0.001[b]

[a] Data is for 78 zones

[b] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

N.B. N = years (converted from site months given for before/after data for 20mph zones)

N.B. N = number of sites for Speed data. The authors state that without adjustment for trends on unclassified roads, the present results for 20mph zones in London represent a 51% reduction in casualty frequency (all severities) in children. However, making full allowance for the trends on unclassified roads, that is assuming that they have been brought about by other factors than 20mph zones, e.g. improved education or training, the reduction in casualty frequency (all severities) is revised to 42% for children. Similarly for the KSI casualty frequency, without adjustment, the present results represent a 60% reduction in KSI casualty frequency in children. However, making full allowance for the trends on unclassified roads, the reduction in KSI casualty frequency is revised to 45% for children.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Webster & Mackie **Year:** 1996 **Title:** Review of Traffic Calming Schemes in 20 mph Zones **Aim of study:** To review all of the 20mph zones schemes resulting from the 20mph Zone initiative introduced by the Department of Transport in December 1990. **Study design:** Uncontrolled B&A	**Country:** UK **Describe country details:** Developed; public health care system. **Setting:** 20mph zones in England that had been installed for at least 12 months. Detailed examples given are set in a mixture of environments including residential areas, a shopping street, a town centre, a single road scheme. **Location:** mixture of urban and	**Arm No:** 1 **Name:** Before 20mph zones **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if**	Casualties All casualties (all)('All' casualties appears to include pedestrians and cyclists only in this study.) Pedestrian casualties (all) Pedal cyclist casualties (all) All KSI casualties(KSI casualties includes 'Serious' and 'Fatal' casualties which have been reported separately in this	**Limitations identified by author:** NR **Limitations identified by review team:** Lengths of data collection periods in tables do not always appear to match up with the defined minimums or maximums stated in the text. The words 'casualty' and 'accident' are used interchangeably. **Evidence gaps and/or recommendations for future research (as stated by authors):**

Quality score: + **External validity score:** ++ Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	rural **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** Data collected retrospectively in 1996; schemes implemented from approx. 1989 onwards. Data was said to be collected for at least a 3 year 'before' period, although the shortest 'before' data collection period given in the tables appears to be 24 months. It was implied that data was collected for at least a 1 year 'after' period, although the shortest 'after' data collection period given in the tables appears to be 6 months. **Age of group data collected for:** Children aged 15 or under. **Other data collection notes:** This study includes data for five 20mphs zones in London that were also included in the study 10369. Data were extracted from these two studies separately, but there is some overlap between the two. Information was obtained regarding 240 zones in England, including permanent, temporary and proposed zones, and also including different phases of the same zone, however only 72 schemes had been in place for at least 1 year, which was sufficiently long enough to provide an average of 30 months 'after' accident data. These have been used in analysis. Change in speed data was only	**applicable):** - **What delivered:** It is implied that most zones had 30mph speed limits prior to the intervention. **Arm No:** 2 **Name:** After 20mph zones **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** - **What delivered:** About 80% of zones were in predominantly residential areas, including four villages. The remainder were in shopping and commercial areas including 10% in city or town centres. 15% of the zones could be described as linear (being single roads). Half of the schemes had bus routes running through them. The most common measures were round-top humps (52% of measures installed), and flat-top humps (30%). Raised junctions acoounted for 10% and sets of speed cushions for 4%, with the remainder of measures being pinch points, chicanes, mini-roundabouts and rumble strips. Some of the	study.'All' casualties appears to include pedestrians and cyclists only in this study.) All 'slight' casualties('All' casualties appears to include pedestrians and cyclists only in this study.) Speed Mean speed(Speed is measured in mph.)	NR **Source of funding:** The report was produced by the Transport Research Laboratory under a contract placed by the Department of Transport.

	available for 32/72 zones.	tables and humps have pinch-points and chicanes incorporated. Indications that measures generally need to be less than 100m apart to achieve speeds which comply with the 20mph zone guidelines were taken into account when temporary authorisations were given. Length of roads (comprising one zone): maximum = 25km, minimum = 0.19km. The average length of road in each zone was 3.3km. Size of schemes: excluding the linear schemes, the average size of schemes was 0.28km^2.		

Baseline characteristics

Results

	Before 20mph zones			After 20mph zones				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
All casualties (all)[a]	3.53	369		2.43	84		RaR=0.331 (SE 1.129)	<0.001[b]
All KSI casualties[a]	3.53	90		2.43	15		RaR=0.242 (SE 1.322)	<0.001[b]

All 'slight' casualties[a]	3.53	279	2.43	69	RaR=0.359 (SE 1.144)	<0.001[b]
Mean speed	32		32		MD=-9.300	

[a] Data is for 72 zones

[b] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

N.B. N = number of sites for Speed data. 'After' speeds (from which changes were calculated) were means of 'on' and 'between' traffic calming measures.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): Wheeler AH & Taylor MC. **Year:** 2000 **Title:** Changes in accident frequency following the introduction of traffic calming in villages **Aim of study:** To study the impact on accidents of traffic calming measures in villages. **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** ++ **Method of allocation to intervention/control** **Method of allocation:** NA **Study sufficiently powered?** NA	**Country:** UK **Describe country details:** Developed; public health care system **Setting:** Village traffic calming schemes. Schemes for evaluation were selected to include a broad geographic spread (across Great Britain), a range of village size, main road class and traffic flow, and a range of speed reducing measures. The main selection criteria for the major road schemes were: a two-way daily flow of through traffic of at least 8000 vehicles per day, at least 10% of the flow comprising heavy vehicles, the inclusion of more extensive and/or substantial measures than the schemes typical on the smaller roads. Further details of individual village settings are available in the original study publications for the	**Arm No:** 1 **Name:** Before Traffic Calming Schemes **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** All but 7 villages were subject to a 30 or 40mph speed limit before the schemes were introduced. **Arm No:** 2 **Name:** After Traffic Calming Schemes	Injury accidents involving child pedestrians (all)(Accidents occuring on the main road (including at junctions) between the position of the gateways (or speed limit terminal signs if no gateways were introduced) were included in the analysis.) Injury accidents involving child cyclists (all)(Accidents occuring on the main road (including at junctions) between the position of the gateways (or speed limit terminal signs if no gateways were introduced) were included in the analysis.) Slight injury accidents involving child pedestrians(Accidents occuring on the main road (including at junctions) between the position of the gateways (or speed limit terminal signs if no gateways were	**Limitations identified by author:** None reported. **Limitations identified by review team:** Numbers of injury accidents reported rather than actual numbers of casualties. **Evidence gaps and/or recommendations for future research (as stated by authors):** None reported. **Source of funding:** The report was produced by the Transport Research Laboratory under/as part of a contract placed by the Department of the Environment, Transport and the Regions.

	VISP and the 'major roads' studies (Wheeler et al, 1994; Wheeler & Taylor, 1999). **Location:** Rural **Selected area(s) / population(s):** NA **Excluded population/s:** NA **Study year(s):** Data was collected retrospectively. Schemes were installed from 1991 onwards. Data were collected for at least a 5 year 'before' period. At least 5 years of 'after' data were available for the schemes installed before 1994; between 2 and 4 years 'after' data was available for most of the more recent 'major road' schemes (lowest amount available was 1.8 years). **Age of group data collected for:** Children under 16 years. **Other data collection notes:** 56 village traffic calming schemes were studied. Injury accident data were extracted from TRL's STAT19 database. All relevant local highway authorities were also contacted for supplementary information for each village to support this data. Within this study the sites have been weighted by the number of years of data used to calculate the site average figure for accident frequencies etc. Sites where significant changes in traffic flow were reported during the study period (due for example to the opening of a new road) were excluded from the study. No changes in flow, other than those occurring naturally due to national trends, were reported at the sites studied, although the local authorities did not always have	**Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** Some speed cameras and speed camera signing were introduced; one incidence of a school crossing patrol was mentioned. **What delivered:** 56 village traffic calming schemes were studied. This comprised: 24 schemes aimed at reducing speeds on main roads through villages, installed between 1992-93; 9 schemes aimed at reducing speeds on more major roads through villages, particularly trunk roads, installed between 1995-97; and an additional 23 schemes (not previously studied) installed between 1991-97. At 10 villages speeds were reduced as part of the scheme. At two villages the speed limit remained at 60mph. Traffic calming measure included: pelican crossings, zebra crossings, enhanced/new signing, village names and 'slow' plates on backing board incorporating flashing lights activated by vehicles, school crossing signs with flashing lights, white field gates/white vertical planking carrying signing on verges at gateway, speed limit roundels, school markings, SLOW marking, reflective marker posts, surface colour changes, block paved surfacing, narrowing by islands, kerb extensions, hatching, dragon's teeth marking and edge lines, rumble strips/areas before start of speed limit, textured bands	introduced) were included in the analysis.) Slight injury accidents involving child cyclists(Accidents occuring on the main road (including at junctions) between the position of the gateways (or speed limit terminal signs if no gateways were introduced) were included in the analysis.) KSI injury accidents involving child pedestrians(Accidents occuring on the main road (including at junctions) between the position of the gateways (or speed limit terminal signs if no gateways were introduced) were included in the analysis.) KSI injury accidents involving child cyclists(Accidents occuring on the main road (including at junctions) between the position of the gateways (or speed limit terminal signs if no gateways were introduced) were included in the analysis.)	

	detailed information on traffic flows.	in advance of gateways, pinch points, chicanes, mini-roundabouts, islands, splitter islands, footway widening, kerb realignment, weight restrictions, illumination, pedestrian refuge, buff bar markings, speed cushions, road humps, double white lines, sheltered parking and environmental enhancements.		

Baseline characteristics

Results

	Before Traffic Calming Schemes			After Traffic Calming Schemes				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Injury accidents:								
Injury accidents involving child pedestrians (all)[a]	1	6.6		1	4		RaR=0.606 (SE 1.884)	0.425[b]
Injury accidents involving child cyclists (all)[a]	1	5.4		1	2.7		RaR=0.500 (SE 2.107)	0.343[b]
Slight injury accidents involving child pedestrians[a]	1	3.3		1	3.2		RaR=0.970 (SE 2.191)	0.969[b]
Slight injury accidents involving child cyclists[a]	1	4.3		1	2.1		RaR=0.488 (SE 2.321)	0.385[b]
KSI injury accidents involving child pedestrians[a]	1	3.3		1	0.8		RaR=0.242 (SE 3.477)	0.217[b]
KSI injury accidents involving child cyclists[a]	1	1.1		1	0.6		RaR=0.545 (SE 4.977)	0.701[b]

[a] Data is for 56 villages
[b] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

N.B. N = years in all cases. Within this study sites have been weighted by the number of years of data used to calculate the site average figure for accident frequencies etc.

Speed data was not provided in the current publication, but it was given in publications for two of the original studies included. In the VISP study (Wheeler et al, 1994) changes in 85th percentile speeds were given. These ranged from small increases to a reduction of 13mph. There were 120 sites/times where 85th percentile speeds were measured, across 24 villages; speed reductions were noted at 98 of these. See original study for further details. In the second study (Wheeler & Taylor, 1999) the authors report that vehicle speeds were reduced almost everywhere. With the exception of one of the gateways (where speed increased), 85th percentile speeds decreased by between 3-15mph, both inbound at gateways and in the villages themselves. Mean speed reductions were generally up to about 2mph less than reductions in 85th percentile speeds. It is noted that a range of different measures

have been used in combination, making it difficult to compare their effect, particularly as the circumstances in which they were installed varied considerably between villages.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): WSP Development and Transportation. **Year:** 2008a **Title:** Cowley Road Oxfordshire County Council **Aim of study:** The aim of the report was to provide an interim evaluation of the Mixed Priority Scheme in Oxfordshire (36 months 'after' data was not available at the time of reporting), and also to disseminate the success of the project and encourage highway authorities to consider the approach when dealing with complex urban streets that fulfill a number of different functions. The main aims of this Mixed Priority Routes scheme were: to reduce accidents and casualties, particularly among the pedestrians and cyclists; lessen congestion for all road users; allow more predictable journey times for bus users and operators; create a more comfortable, convenient and attractive environment for users of the shops and businesses; And enhance economic vitality of the commercial area. **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** +	**Country:** UK **Describe country details:** Developed; public health care system **Setting:** Cowley Road (Oxfordshire), a radial route from the south-east of the city with a typical flow of around 10,000 vehicles. It features a mix of retail (small/medium sized businesses), restaurants and bars/clubs creating a busy day and night-time environment. High density housing bounds the route and there is a diverse and somewhat transient population, with many houses being of multiple occupation e.g. students. It is an important bus corridor with over 650 buses per day and is one of the busiest routes for cyclists in the city with flows in excess of 3000 cyclists each day. **Location:** Urban **Selected area(s) / population(s):** There was a scheme selection process. Each authority was chosen for funding for a scheme on it's potential merits of providing different challenges and barriers to overcome in order to deliver the project. Additionally, the selection of second tranche authorities was influenced by the first round selection with the aim of having two 'matched' schemes (similar in	**Arm No:** 1 **Name:** Before Mixed Priority Route scheme **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** The restricted carriageway space limited the amount of parking and loading available on-street, resulting in many vehicles stopping illegally and exacerbating the congestion problems on the route. There were no major junctions intersecting the route, however there are a large number of junctions with residential roads which link Cowley Road to adjacent radial routes out of the city. A number of these linking side roads are one way, and additionally some turning movements are banned. The majority of business premises have no rear servicing and although there is a medium sized public car park accessed off one of the side roads, the pressures for short term on street parking and loading significantly exceed the actual 'legal' availability taking account of the limited kerb space available (itself reduced by the need to	Casualties Pedal cyclist 'slight' casualties Pedestrian casualties (all) Pedestrian KSI casualties(KSI casualties includes 'Serious' and 'Fatal' casualties which have been reported separately in this study.) Pedal cyclist casualties (all) Pedal cyclist KSI casualties(KSI casualties includes 'Serious' and 'Fatal' casualties which have been reported separately in this study.) Pedestrian 'slight' casualties Speed Mean speed(Speed is measured in mph.)	**Limitations identified by author:** NR **Limitations identified by review team:** It is not clear what the exact dates for data collection were. **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The report was commissioned by the Department for Transport.
Method of allocation to intervention/control				

Method of allocation: NA **Study sufficiently powered?** NA	terms of the physical and political environments). Of all the authorities meeting the selection criteria, Oxfordshire County Council had one of the most severely constrained routes with particularly narrow carriageways through the central section. This created a great deal of conflict between road users which was considered quite unique in terms of the challenge it posed. The Oxfordshire scheme was seen as an excellent example of a Mixed Priority Route with the issues of parking and traffic management and gaining acceptance from local residents and traders providing a considerable challenge to the project team. **Excluded population/s:** NR **Study year(s):** The construction phase for the programme was in 2005, and data were collected for a 3 year 'before' period and a 1 year 'after' period, although it is not clear what the exact dates for data collection were. **Age of group data collected for:** 15 years and under. **Other data collection notes:** -	provide for bus stops, controlled crossings and refuges). Parking pressures on the side roads were also intense, with the majority of houses having no off-street parking and as a result a residents parking scheme operates in all the side roads. Although some environmental enhancements had been carried out at some locations as part of the urban regeneration project, the overall quality of the streetscape was mixed. Previous measures to improve safety and pedestrian provision had been carried out and led to some local improvements; however, the accident rate remained extremely high, and some of the past measures had in fact led to other problems. **Arm No:** 2 **Name:** After Mixed Priority Route scheme **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** As part of the initiatives to reduce cycle accidents, a written agreement was established between the council and bus operators to include cycle awareness in driver training and include speed monitoring on buses to assess driver behaviour. A public exhibition in the early stages of consultation attracted reports on the local radio and television		

		stations as well as in local newspapers. Further media interest in the road safety scheme came as a result of the death of a young student involved in an accident on Cowley Road. **What delivered:** The scheme is approximately 1km long, with road widths varying from 7.5m at its narrowest to 11m wide (with 9m being the ruling width for the majority of the scheme length). Key aspects of the design include: Three 'special areas' extending between 75 and 150m where the carriageway was raised (on gentle gradient ramps) to footway level and the width of the running carriageway was reduced to 6.5m; buff anti skid surfacing used throughout to highlight these areas. The intention was for these areas to act as a 'shared space'; A 20mph speed limit in the core of the shopping area which included all three special areas (four compact vehicle activated signs were also included to encourage compliance); Minimum use of carriageway markings in this length - though cycle symbols were painted in the centre of lanes to encourage a sense of 'shared' space for vehicle traffic; Kerb build outs at junctions to prevent parking and loading in the immediate vicinity of junctions, and to create lengths of 'sheltered' parking / loading bays; Establishing formal parking and loading provision in marked bays rather than on the carriageway; Additional cycle parking and seating in extended footway areas; Three additional zebra crossings; Additional raised crossings at side		

		road junctions to assist pedestrians; Repaving of footway and planting of additional trees; And Relocation of some of the bus stops.		

Baseline characteristics

Results

	Before Mixed Priority Route scheme			After Mixed Priority Route scheme				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
Pedal cyclist 'slight' casualties	3	0		1	1			
Pedestrian casualties (all)	3	2		1	0		RaR=0.600 (SE 4.708)	0.157[a]
Pedestrian KSI casualties	3	0		1	0			
Pedal cyclist casualties (all)	3	0		1	1			
Pedal cyclist KSI casualties	3	0		1	0			
Pedestrian 'slight' casualties	3	2		1	0			
Mean speed							MD=-1.700	

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): WSP Development and Transportation. **Year:** 2008b **Title:** Newland Avenue: Kingston-	**Country:** UK **Describe country details:** Developed; public health care system	**Arm No:** 1 **Name:** Before Mixed Priority Route scheme	All casualties (all) Pedestrian casualties (all) Pedal cyclist casualties (all)	**Limitations identified by author:** NR **Limitations identified by review team:** Age range of children was

upon-Hull City Council **Aim of study:** The aim of the report was to provide an interim evaluation of the Mixed Priority Scheme in Hull (36 months 'after' data was not available at the time of reporting), and also to disseminate the success of the project and encourage highway authorities to consider the approach when dealing with complex urban streets that fulfill a number of different functions. The main aims of this Mixed Priority Routes scheme were to: reduce road casualties – especially those involving vulnerable road users; provide good access throughout the area for people with disabilities; reduce mean traffic speeds; increase the level of cycling and walking along Newland Avenue; engage residents, traders & interest groups in the design and operation of the project; and provide road safety educational opportunities for parents and children. **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	**Setting:** Newland Avenue (Kingston-upon-Hull) is a local distributor road approximately 2 miles north of Hull city centre, supporting small businesses and a school. It is bounded by high density housing, with relatively low traffic and parking demand but high cycle and pedestrian flows. This busy street provides everyday shopping facilities whilst the variety of independent retailers attracts visitors from the wider area; contributing to the vitality of the local high street. Cafes/ bars, a school and access to housing on surrounding streets are also found along Newland Avenue's 900m length. Residential areas include large areas of student housing due to their proximity to the university. **Location:** Urban **Selected area(s) / population(s):** There was a scheme selection process. Each authority was chosen for funding for a scheme on it's potential merits of providing different challenges and barriers to overcome in order to deliver the project. Additionally, the selection of second tranche authorities was influenced by the first round selection with the aim of having two 'matched' schemes (similar in terms of the physical and political environments). The inclusion of Newland Avenue in the project was justified by the conflicting priorities in an area of social deprivation. Additionally, the council had been very successful in implementing a large number of 20mph zones with wide public acceptance and the potential to move this concept forward provided great potential for	**Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Predominant carriageway width was around 10m. Footways were generally 2.5m wide although shop forecourts gave a wider effective width for shoppers. The speed limit along the route was 30mph and most of the adjacent residential side roads were subject to 20mph limits (with associated traffic calming). There were three school crossing patrol sites along the route. Limited waiting restrictions were in place to encourage greater turnover in short term parking for shoppers whilst discouraging all day parking. Parking and loading bays were all located on the carriageway of Newland Avenue where space permitted. All residential streets adjoining Newland Avenue had traffic calming measures in place. **Arm No:** 2 **Name:** After Mixed Priority Route scheme **Type of intervention:** Road/street redesign/engineering-based **Details of other components of**		not specified. **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The report was commissioned by the Department for Transport.

	a demonstration project. **Excluded population/s:** NR **Study year(s):** The construction phase for the programme was in 2004/5, and data were collected for a 5 year 'before' period between Sept 1998 - Aug 2003 and a 1 year 'after' period between Nov 2005 and Oct 2006. **Age of group data collected for:** NR **Other data collection notes:** Data were collected for a 3 year 'before' period and a 1 year 'after' period. Child specific data were only available for 56/71 engineering scheme sites, and 74/79 safety camera sites.	**scheme/intervention (if applicable):** Consultation, including a 'Launch Event' and regular design workshops with residents and local traders, was carried out. The press were involved in the wider promotion of the scheme. **What delivered:** Key aspects of the design include: existing pelican crossings replaced by a combination of zebras and informal marked crossings on raised tables to meet desire lines; a 'median strip' in the centre of the carriageway alongside parking/loading bays on the busy central areas; raised bus boarding areas; gateway feature at one end; echelon parking to maximise the number of parking spaces where demand is high; loading bays to be located on side roads near to shops rather than on Newland Avenue itself; Speed Cushions in between raised areas at one end of the scheme; establishment of a 20mph zone; creation of an 'urban square' with seating, cycle shelters and increased/enhanced pedestrian space; seating and planters along the whole scheme to provide overall environmental enhancement; and bollards to prevent vehicle encroachment onto areas of widened footway, particularly at loading bays where heavy vehicles could potentially damage the surface.		
Baseline characteristics				

Results

	Before Mixed Priority Route scheme			After Mixed Priority Route scheme				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
All casualties (all)	5	6		1	2		RaR=1.667 (SE 2.263)	0.593[a]
Pedestrian casualties (all)	5	5		1	0		RaR=0.455 (SE 4.380)	0.025[a]
Pedal cyclist casualties (all)	5	0		1	0			

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.

Speed data were also collected: there were 42 sites/times where speeds were measured across 7 locations; speed reductions were noted at 35 of these. See original study for further details.

Study details	Population and setting	Arms	OUTCOMES	Notes
Author(s): WSP Development and Transportation. **Year:** 2008c **Title:** Renshaw Street/ Berry Street: Liverpool City Council **Aim of study:** The aim of the report was to provide an interim evaluation of the Mixed Priority Scheme in Liverpool (36 months 'after' data was not available at the time of reporting), and also to disseminate the success of the project and encourage highway authorities to consider the approach when dealing with complex urban streets that fulfill a number of different functions. The main aims of this Mixed Priority	**Country:** UK **Describe country details:** Developed; public health care system **Setting:** Berry Street and Renshaw Street (Liverpool) are among the busiest roads in the city, forming a direct route from the centre to the south of the city. The route is lined with major shops, restaurants, clubs, pubs and fast food outlets. The roads are heavily used by pedestrians at all times of the day. At night they are used not only by shoppers, tourists and workers but also by restaurant customers and club goers. Liverpool University has halls of	**Arm No:** 1 **Name:** Before Mixed Priority Route scheme **Type of intervention:** Before intervention **Details of other components of scheme/intervention (if applicable):** - **What delivered:** Renshaw Street and Berry Street both featured wide single carriageway running with bus stops in bay areas and parking and loading provision provided on-street. Narrow	Casualties Pedal cyclist 'slight' casualties Pedestrian casualties (all) Pedestrian KSI casualties(KSI casualties includes 'Serious' and 'Fatal' casualties which have been reported separately in this study.) Pedal cyclist casualties (all) Pedal cyclist KSI casualties(KSI casualties includes 'Serious' and 'Fatal' casualties which have been reported separately in this study.) Pedestrian 'slight' casualties Speed	**Limitations identified by author:** NR **Limitations identified by review team:** - **Evidence gaps and/or recommendations for future research (as stated by authors):** NR **Source of funding:** The report was commissioned by the Department for Transport.

Routes scheme were: to create a safer and improved corridor for pedestrians and public transport without having a significantly adverse effect on the road's role as a primary distributor road; to provide enhanced pedestrian movement and improved pedestrian crossing facilities particularly around the Adelphi Interchange; and to create a quality public realm to provide an attractive streetscape and to encourage future investment in the area. **Study design:** Uncontrolled B&A **Quality score:** + **External validity score:** + Method of allocation to intervention/control **Method of allocation:** NA **Study sufficiently powered?** NA	residence in the area which, combined with a number of further residential developments, results in a high through flow of pedestrians. **Location:** Urban **Selected area(s) / population(s):** There was a scheme selection process. Each authority was chosen for funding for a scheme on it's potential merits of providing different challenges and barriers to overcome in order to deliver the project. Additionally, the selection of second tranche authorities was influenced by the first round selection with the aim of having two 'matched' schemes (similar in terms of the physical and political environments). The Liverpool scheme was seen as a challenging environment to move from the city centre environment to Chinatown. The link made to planning and regeneration initiatives to encourage wider improvements was also seen to be beneficial for the wider demonstration project. **Excluded population/s:** NR **Study year(s):** The construction phase for the programme was in 2004/5, and data were collected for a 3 year 'before' period between Dec 2001 - Nov 2004 and a 10 month 'after' period between Dec 2005 and Sept 2006. **Age of group data collected for:** 15 years and under. **Other data collection notes:** Data were collected for a 3 year 'before' period and a 10 month 'after' period.	footpaths were a recognisable feature along the route. Key signalised junctions had two lanes of traffic with lane designations. Many of the side streets along the route had one way traffic restrictions in place. **Arm No:** 2 **Name:** After Mixed Priority Route scheme **Type of intervention:** Road/street redesign/engineering-based **Details of other components of scheme/intervention (if applicable):** A public exhibition and presentations as part of the consultation process. Updates regarding progress were broadcast daily on local radio. **What delivered:** The scheme area runs 800m. Key aspects of the design include: Widening of footways to balance creation of more direct pedestrian crossings; Speed cushions at key locations to reduce vehicle speed; On-street parking and loading provided in formal bays instead of on the carriageway; Interchange re-design with new alignments and restricted turning movements from Brownlow Hill; A 'median strip' along the full length of Berry Street, flush with the carriageway and without any breaks at junctions; Bus infrastructure improvements - wider footways, new bus stops level bus entry kerbs and creation of a bus clearway with coloured surfacing;	Mean speed(Speed is measured in mph. Speed was recorded on 6 occasions both before and after the schemes at 3 locations. The average change data for all of these locations and occasions is reported here.)	

		An Access Control System on one street to control access during very busy weekend-evening hours for pedestrian safety; Provision of open spaces on using the high quality granite paving, street furniture, tree planting and lighting; And Combined street lighting and traffic signal facilities to reduce street clutter and allow future decorative arrangements for use at varying times such as Christmas /Advent decorations. The scheme, although unique in nature as a demonstration project, is one of a number of major redevelopment works in and around the city centre, (driven in part, by the city's status as the European City of Culture 2008). As such there is an effective Council/Consultant partnership in the form of 2020 Liverpool Ltd delivering numerous schemes on this scale.		

Baseline characteristics

Results

	Before Mixed Priority Route scheme			After Mixed Priority Route scheme				
	N	K	MEAN	N	K	MEAN	Δ	*P*
Casualties:								
Pedal cyclist 'slight' casualties	3	0		0.83	0			
Pedestrian casualties (all)	3	3		0.83	1		RaR=1.549 (SE 3.173)	0.878[a]

Pedestrian KSI casualties	3	0	0.83	1	
Pedal cyclist casualties (all)	3	0	0.83	1	
Pedal cyclist KSI casualties	3	0	0.83	1	
Pedestrian 'slight' casualties	3	3	0.83	0	
Mean speed					MD=-1.940

[a] Calculated by reviewer using raw casualty frequency data. MLE hypothesis test used.