



20mph Research Study

Process and Impact Evaluation
Headline Report

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Process and Impact Evaluation Technical Report

Technical Appendices:

Rapid Evidence Review
Methodology Description Report
Case Study Description Report
Residents' and drivers' questionnaires - Logistic regression analysis
Analysis of GPS journey speeds in case study areas
Analysis of spot speed data in case study areas
Analysis of safety outcomes in case study areas

Executive summary

Introduction

In July 2014, Atkins, AECOM and Professor Mike Maher of University College London, were commissioned by the Department for Transport to evaluate the effectiveness of 20mph (signed only) speed limits, based on twelve case study schemes in England and various comparator areas with a 30mph limit in place.

The purpose of the research is to:

- examine the perceptions and attitudes of different user groups towards 20mph speed limits;
- strengthen the evidence base regarding the effectiveness of 20mph limits;
- inform future policy development on 20mph speeds and limits at a national and local level;
- identify lessons learned regarding the implementation and monitoring of 20mph signed only speed limits, to guide local authorities considering introducing 20mph limits.

The study comprises a **process evaluation** which looks at why and how case study schemes were delivered, and an **impact evaluation** which examines the effectiveness of schemes in delivering intended outcomes.

This report presents the headline findings and conclusions based on a broad range of quantitative and qualitative data sources. Further detail on the methodology, data sources and analysis undertaken is provided in the technical report.

Policy and legislative context

In 1999, the Road Traffic Regulation Act 1984 was amended to allow local authorities to designate 20mph speed limits without the prior approval of the Secretary of State.

In 2013, DfT provided revised guidelines on the **Setting Local Speed Limits (DfT Circular 01/2013)**, encouraging traffic authorities to consider introducing more 20mph limits over time, and over a larger number of roads. It states that where there is expected to be a positive effect on road safety and a generally favourable reception from local residents, traffic authorities are able to use their powers to introduce 20mph speed limits on major streets where foot and cycle movements are important, and on residential streets where the characteristics of the street are suitable. It advises that 20mph limits are most appropriate where the mean speed is already at or below 24mph; and states that speed limits should encourage self-compliance with no expectation of additional police enforcement.

There has been a substantial growth in the implementation of area-wide limits in recent years, in response to the guidance.

Methodology

The overall approach is based on evidence from twelve ('core') case study schemes, comprising a variety of area types, road types, and scale:

Category	Case Study schemes	
Predominantly residential schemes – small scale standalone , covering an individual neighbourhood (two schemes):	Walsall (Rushall)	Winchester (Stanmore)
Predominantly residential schemes – large scale area-wide schemes , covering a substantial portion of the town or city in question (eight schemes):	Liverpool (Area 7) Liverpool (Area 2) Middlesbrough Calderdale (Phase 1)	Nottingham (Bestwood) Brighton (Phase 2) Portsmouth Chichester
City or town centre and adjacent residential areas (two schemes):	Brighton (Phase 1)	Winchester (City Centre)

The schemes involved lowering the speed limit from 30mph to 20mph through signing and road markings, and supporting community engagement activities to raise awareness and encourage support. None of the schemes involved the introduction of physical traffic calming measures or changes to the street design.

Eleven of the schemes were implemented between March 2012 and June 2015. The twelfth scheme was implemented before 2010, allowing the longer-term trend in speed performance to be observed.

A further three case studies cover local authorities that have chosen not to implement a 20mph limit scheme ('no schemes'), and are used to understand the barriers and considerations behind such decisions. In addition, three comparator areas are used to identify background trends in speeds on 30mph roads with similar characteristics to the 'core schemes'; and regional-based data is used to identify background trends in collisions and casualties on similar 30mph roads.

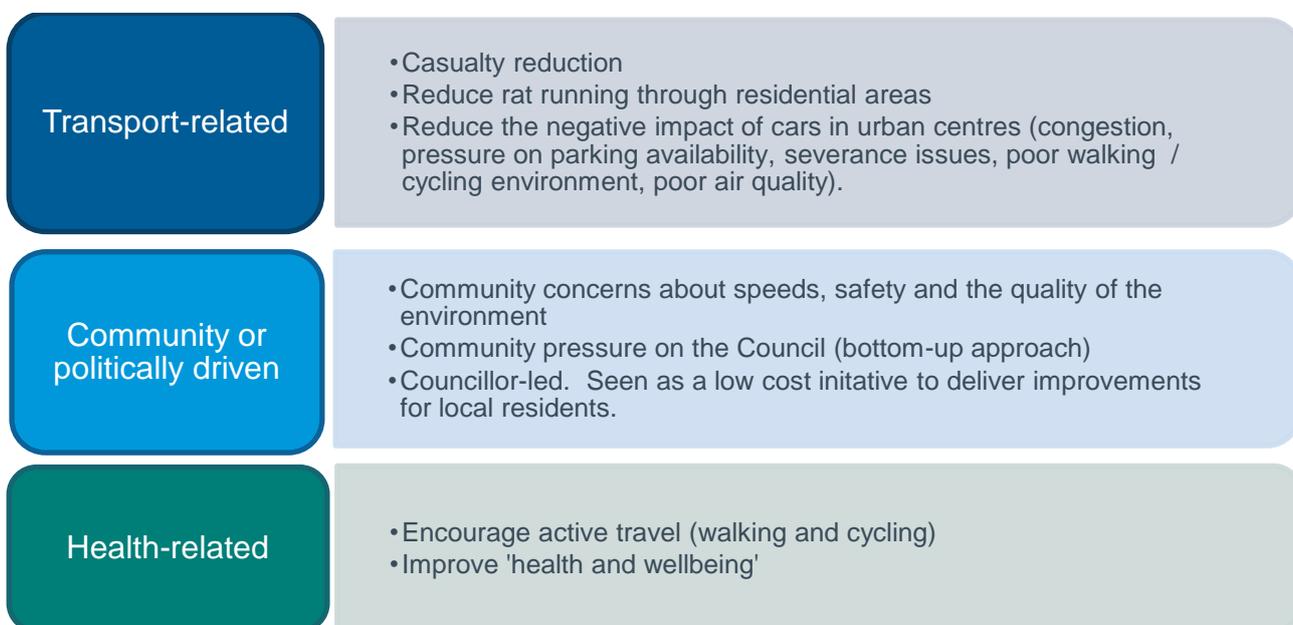
The evaluation is based on the following evidence sources:

- Questionnaire surveys with 2,170 residents living in or near the new 20mph limits (drivers and non-drivers); 1,256 drivers living outside the case study areas (non-resident drivers); and 1,655 cyclists and 352 motorcyclists nationwide.
- In-depth interviews with 177 non-resident drivers.
- Nine focus groups with residents and specific user groups (cyclists, young drivers, parents).
- Interviews with 60 local stakeholders (officers, councillors, police, health, bus operators, interest groups).
- Analysis of speed outcomes based on GPS vehicle data (measuring area-wide journey speeds) covering over 700kms of new 20mph (signed only) limits, and spot speed data (measuring instantaneous speeds).
- Analysis of safety outcomes based on DfT road accident statistics (STATS19) data.

The study has not sought to collect primary data on wider impacts relating to the local economy, the environment and health.

Why and how were 20mph limits introduced?

Interviews with stakeholders indicate that the key motivations behind the case study schemes can be categorised as transport-related, community or political, and health-related; with most schemes driven by a combination of these factors.



In general, 20mph limit schemes provide an opportunity to address a wide range of policy areas in what is perceived to be a low-cost manner. The majority of schemes therefore have a range of objectives which span road safety, promotion of active travel modes, perceived quality of the environment, health and wellbeing, and community benefits. The most common objectives are focused around community and health themes. Accident reduction is not a key driver behind many of the case study schemes.

Local authority stakeholders were asked to identify and rank enablers and barriers which affected the extent to which schemes were delivered to the anticipated quality, programme, and cost, and were accepted by the public. Early engagement and buy-in from stakeholders was the most frequently mentioned enabler as this helps to minimise objections from the local community and businesses, secure support in scheme delivery from potential partners, enables the scheme to be delivered quickly, and increases public acceptance of the new limit. The most frequently mentioned barrier was 'limited funding and staffing resources', for design, delivery and post implementation activities (engagement, enforcement-related interventions, and monitoring).

20mph schemes have the potential to deliver a wide range of transport and other benefits. This provides an opportunity for scheme promoters to work and engage with a range of policy and interest groups; and the most effective schemes are likely to be those which are based on a broad integrated policy agenda (involving health, environment, urban planning, emergency services, education, community representatives, etc.). Longer-term 20mph schemes which are supported by complementary policies and interventions are likely to deliver greater benefits.

Is there support for 20mph limits?

The study examines the level of support for 20mph (signed only) limits amongst different user groups through the questionnaire surveys. This shows high levels of post implementation support amongst cyclists (81%), residents (75%), and non-resident drivers (66%); but less support amongst residents in neighbouring 30mph areas (44%) and opposition from motorcyclists (29% supportive, 47% unsupportive). There was also little call for the limit to be changed back to 30mph (12% support amongst residents and 21% amongst non-resident drivers).

Net support (% saying 'good idea' - % saying 'bad idea') amongst residents increased significantly after the implementation of the schemes (from +58% to +63%)¹, suggesting that some pre-implementation concerns did not materialise or became more acceptable.

The most common area of concern across all user groups considered was around compliance, with most focus group and survey participants of the opinion that stronger enforcement measures are needed if 20mph limits are to be effective.

How have speeds and driver behaviour changed?

To what extent do drivers comply with the limit? – Evidence from the journey speed analysis shows that following implementation, 47% of drivers in residential areas and 65% of drivers in city centre areas (equating to 51% across both categories) complied with the new 20mph limit, travelling at speeds of less than 20mph. Whilst a substantial proportion are exceeding the limit, the majority are travelling at less than 24mph (i.e. at speeds close to 20mph): 70% in residential areas and 85% in city centre areas.

The nature of the roads where the limits have been introduced means that lower speeds were already 'self-enforced'. Reducing the speed limit to 20mph has helped reinforce this process. There are now slightly more drivers travelling at speeds of less than 24mph (+5 percentage points in residential areas, and +7 percentage points in city centre areas), suggesting faster drivers have slowed down.

How has the profile of speeds changed? – The journey speed analysis shows that the median speed has fallen by 0.7mph in residential areas and 0.9mph in city centre areas. Faster drivers have reduced their speed more, with the 85th percentile speed² falling by -1.1mph in residential areas and by -1.6mph in city centre areas, based on journey speed data. This is a key finding, as other research shows that higher speeds are associated with increased safety risk (more collisions, increased severity, perceptions that the environment is not safe for vulnerable users).

The overall change in speeds is greater where speeds were faster before. The median speed fell by -1.3mph on residential roads with a before speed of more than 24mph; and by -1.1mph on 'important local roads'³ which typically had higher before speeds. On 'minor local roads' the median speed was already below 20mph and dropped by just 0.1mph.

¹ % saying 'good idea' increased from 71% to 75%.

² This is the speed that 85 percent of vehicles do not exceed.

³ Case study roads have been classified as 'minor local roads', 'important local roads', and 'major strategic roads' using TomTom's Functional Road Classes, which provides a proxy for the size, nature and purpose of each road.

The results suggest that road characteristics have a much larger impact on the speeds that drivers choose to adopt than whether the road has a 30mph or 20mph limit. The differences in speed between the different road categories are far larger than the changes brought about by lowering the speed limit.

Bigger changes were recorded at individual spot speed sites, with the change in mean speed varying from -7.2mph (reduction) to +4.3mph (increase); and the change in 85th percentile speeds varying from -9.0mph (decrease) to +7.6mph (increase).

The reductions in average speed in the case study areas are similar to those observed in other research studies, which have reported reductions in average speed of 0.5-2mph (with varying accountability for background trends).

What evidence is there of a 20mph limit impact? – Statistical analysis shows a significant reduction in speeds, relative to similar 30mph comparator areas, for ‘important local roads’ in residential areas and for an aggregation of all road types in city centre areas:

- The relative change on important local roads in residential areas is estimated at -0.8mph for the median speed and -1.1mph for the 85th percentile speed.
- The relative change across all roads in city centre area, is estimated at -0.6mph for the median speed, and -1.0mph for the 85th percentile speed.

The findings suggest that the absolute changes in speed observed in the case study areas are partly due to the implementation of 20mph limits, but also reflect background trends in speed on urban roads.

How have speeds on neighbouring roads changed? – Journey speed analysis shows a small decline in speeds on surrounding 30mph and 40mph roads across the case study areas; suggesting that in general, drivers are not trying to make up for lost time when leaving a 20mph limit area.

What do residents and drivers say? – The majority of resident (about two-thirds) and non-resident drivers (just over half) have not noticed a reduction in the speed of vehicles, and do not perceive there to be fewer vehicles driving at excessive speeds for the area. This is not surprising as the actual reduction in speed has been small. However:

- Most resident drivers (72%) and non-resident drivers (69%) agreed that the 20mph limit makes it more acceptable to drive at a lower speed.
- A net proportion (% agree - % disagree) of non-resident drivers (+44%) and resident drivers (+7%) agreed that 20mph limits increase driver awareness of potential risks and hazards.

What factors influence speed compliance?

Lack of enforcement and lack of concern about the consequences of speeding were identified as the primary reason for non-compliance in driver interviews and the various focus groups. There is a widespread view amongst the public that 20mph limits are not enforced, and the likelihood of being caught exceeding the limit is very small; and this is one reason why bigger reductions in speed have not been observed in scheme areas.

Factors associated with compliance included the nature of the road environment, presence of vulnerable users, discussion within the community about road safety, and drivers with children.

What are the perceptions about walking and cycling in 20mph limits?

Overall, 20mph limits are perceived to be beneficial for cyclists and pedestrians:

- 69% of residents agreed that the 20mph limits are beneficial for cyclists and pedestrians;
- 74% and 77% of non-resident drivers agreed that the 20mph limits are beneficial for cyclists and pedestrians respectively; and
- 69% and 89% of existing cyclists (nationwide) agreed that 20mph limits are beneficial for cyclists and pedestrians respectively.

Focus group discussions suggest that these views are driven by perceptions about the potential safety benefits of slower vehicle speeds, rather than because drivers have been seen to be more considerate to pedestrians and cyclists.

The discussions also suggest that slower speeds are seen as only one of a combination of factors required to improve the environment for walking and cycling. In the case study areas, there continues to be a range of barriers which discourage walking and cycling; and for many drivers' time constraints, journey distance, and a general preference for driving are also important considerations.

How have collision and casualty rates changed?

What has been the change in residential areas? – The comparator analysis indicates that there is insufficient evidence to conclude that there has been a significant change in collisions and casualties following the introduction of 20mph limits in residential areas, in the short term (based on the post implementation data available to date). Although the absolute number of collisions and casualties (per km, per year) has reduced in the residential areas, there has also been a reduction in the corresponding 30mph comparator areas.

Collision and casualty rates are known to fluctuate from year to year. Some of the analysis is based on small subsets of the data (particularly for collisions involving pedestrians, cyclists, children and older persons), and the post implementation data currently available may not be indicative of the longer term trend. Repeating the analysis in a couple of years' time, when more case study data is available, may (or may not) show a significant change.

What has been the change in city centre areas? – The comparator analysis shows that Brighton Phase 1 is the only case study area where the change in collisions and casualties, relative to the 30mph comparator area is significant. The results show a significant reduction in overall collisions (-18%), overall casualties (-19%), pedestrian casualties (-29%), and casualties aged 75 or over (-51%). However, there is no evidence to indicate a significant change in casualties involving cyclists and under 16s, at this time.

The changes appear to be a reflection of the city characteristics; and the blanket implementation of 20mph limits across all roads within the scheme area, including higher flow A and B roads which have typically been excluded from the residential case study schemes. There has been a significant reduction in collisions across all road types, but the change has been most pronounced on major strategic roads.

Overall findings – The evidence available to date shows no significant change in the short term in collisions and casualties, in the majority of the case studies (including the aggregated set of residential case studies).

There is some evidence to suggest a positive 20mph impact in one location (Brighton Phase 1), where a blanket 20mph limit was introduced covering both major and minor roads, and where there is sufficient data to indicate a statistically significant change in collisions and casualties relative to the 30mph comparator area. It should be stressed that this represents just one case study, and the extent to which the findings are transferable to other locations is unclear.

In both cases, further data is required to determine the longer term impact of 20mph limits. Collision and casualty rates are known to fluctuate from year to year, and the post implementation data currently available may not be indicative of the longer term trend.

How have route choice and journey times changed?

How has route choice changed? – Despite some evidence of driver frustration, only 8% of (non-resident) drivers said that they avoided driving in the area, and only 4% of residents felt that there are fewer vehicles using their road. Even with the lower speed limit, in most cases the 20mph roads still appear to provide a more direct and convenient route. The vast majority of drivers do not appear to have changed their route to avoid the new 20mph limit areas.

How have journey times changed? – Journey times are estimated to have increased by 3% in residential areas and 5% in city centre areas, based on the observed change in median speed (from journey speed data). This adds less than half a minute to a two mile trip and less than a minute to a five mile trip. Most drivers are unlikely to notice this level of change. Furthermore, a substantial proportion of drivers were already travelling at less than 20mph, and are unlikely to have experienced a change in their journey times.

How has mode use changed?

Has use of active travel modes changed? – There has been a small (but significant) increase in the proportion of survey respondents stating that they have increased their use of active travel modes. Some

5% of residents surveyed said that they are walking more, and 2% said that they are cycling more, since the introduction of the 20mph limits.

In addition, a small proportion of households with children reported that their children are cycling locally more often since the introduction of 20mph limits (9% of households for children aged 6-10 years, 6% of households for children aged 11-14, and 6% of households for children aged 15-17).

Furthermore, the speed limits are expected to reinforce cycling behaviour amongst existing regular cyclists: 59% of those responding to the cyclists' online survey said that keeping the traffic below 20mph means that they are more likely to cycle to local places.

What is the likelihood of mode shift away from car? – A significant minority of residents said that keeping traffic below 20mph makes it more likely they will walk (16%) or cycle (9%) to local places rather than use the car. Actual mode shift activity is likely to be much less prevalent, but cannot be determined from this data. Changes may occur over time, as a result of the cumulative effect of other sustainable travel interventions or changes in individual circumstances.

What impact do 20mph limits have on the community, local economy, environment and health?

Social and community impacts – The majority of residents (70%) agreed that the 20mph speed limit is beneficial for residents. However, child safety still appears to be a concern, and other potential benefits relating to social interaction (residents out and about on the street) and community pride do not appear to be recognised by the majority of residents. Some 7% of households with children aged 6-10 years and 5% of households with children aged 11-14 reported that their children play outdoors more often since the introduction of 20mph limits.

Local economy – Very few residents (3%) believed that the new speed limit means that people are avoiding the area and are less likely to use local shops and amenities.

Environment and health – No primary data on air quality, greenhouse gas emissions, noise levels, or health has been collected as part of this study.

How do outcomes compare with 20mph zones and older limits?

Some case study roads where the speed limit changed from 30mph to 20mph already had traffic calming in place, in the form of speed humps / tables or chicanes. These have essentially become new 20mph zones. In addition, almost all of case studies had the some pre-existing 20mph limits (signed only and with calming) in place prior to the implementation of the main area-wide scheme; often located outside schools. These roads did not experience a change in limit over the course of the research, but driver behaviour may have been influenced by the introduction of a new 20mph limit over the wider area.

Post implementation of 20mph limits, there is a higher level of compliance on already traffic calmed roads (62%), older 20mph limits (with calming) (66%), older 20mph limits (signed only) (68%); than on new 20mph (signed only) roads (47%).

Extending the area covered by 20mph limits has not changed driver behaviour on adjacent older 20mph limits (with traffic calming), but it appears that there has been some reduction on adjacent older 20mph limits (signed only). It is possible that the presence of calming (road humps, chicanes) and the nature of the associated roads (which are nearly all minor local roads) has already encouraged drivers to reduce their speed as much as they are willing to do so, in the absence of more proactive enforcement. However, on older 20mph limits (signed only) drivers may have been encouraged to reduce their speeds further, in line with their behaviour on new 20mph limits. The sample size for older 20mph limits is smaller than for the other categories of road, and further evidence is needed to support this conclusion.

Conclusions and considerations for decision-makers

This study substantially strengthens the evidence base on perceptions, speed and early outcomes associated with 20mph (signed only) limits. It is the only major UK study to date to consider multiple case study areas and provide a national view.

Local authorities have responded positively to revised guidelines on the setting of local speed limits (DfT Circular 01/2013), resulting in a substantial growth in signed only 20mph area-wide limits in recent years, covering larger areas and often entire urban areas. The majority of 20mph limits have been implemented on roads where the average speed prior to implementation was typically less than 24mph; and the case studies have generally been implemented on the basis that they should be self-enforcing, with no expectation of additional police enforcement.

Based on the findings of this study, the guidance set out in DfT Circular 01/2013 remains broadly valid. However, consideration should be given to encouraging traffic authorities to work with relevant partners from the police, health, environment, urban planning, education, and the local community to deliver 20mph limits as part of an integrated approach to addressing transport, community, environment and health objectives.

The guidance also needs to recognise the concern amongst the public regarding the apparent lack of enforcement, and the general view that the likelihood of being caught exceeding the limit is very small. Where a more proactive enforcement approach by the police is not practical, authorities should be encouraged to consider alternative approaches (e.g. community-based initiatives, use of vehicle activated signs, etc.), which may still require low level involvement of the police.

It is acknowledged that the current guidance is likely to lead to a mix of approaches across the country in terms of speed limits in built up areas, which creates a challenge in terms of embedding a culture of slower speeds in residential and pedestrian environments, and achieving driver compliance where 20mph limits are in place. There may therefore be broader reasons for strengthening the guidance whilst recognising that authorities retain the responsibility for setting speed limits on their roads.

1. Introduction

1.1. Background

In July 2014, Atkins, AECOM and Professor Mike Maher of University College London, were commissioned by the Department for Transport to evaluate the effectiveness of 20mph (signed only) speed limits, based on twelve case study schemes in England and various comparator areas with a 30mph limit in place.

The purpose of the research is to:

- strengthen the evidence base regarding the effectiveness of 20mph limits;
- inform future policy development on 20mph speeds and limits at a national and local level;
- identify lessons learned regarding the implementation and monitoring of 20mph signed only speed limits, to guide local authorities considering introducing 20mph limits.

The study comprises a **process evaluation** which looks at why and how case study schemes were delivered, and an **impact evaluation** which examines the effectiveness of schemes in delivering intended changes in attitudes and behaviour of residents and other road users.

The overall aims of the research are:

1. Evaluate the effectiveness of 20mph speed limits in terms of the range of outcomes and impacts;
2. Examine the perceptions and attitudes of different user groups towards 20mph speed limits; and
3. Evaluate the processes and factors which contribute to the effectiveness of 20mph speed limit schemes.

This report presents the headline findings and conclusions of the evaluation, based on a broad range of quantitative and qualitative data sources. A separate **Process and Impact Evaluation Technical Report** presents the detailed results. Further detail on the methodology, data sources and analysis undertaken is provided in **Supporting Technical Appendices**.

1.2. 20mph limits and zones

There are two distinct types of 20mph schemes:

- 20mph limits – indicated by speed limit signs only; and
- 20mph zones – designed to be ‘self-enforcing’ through the introduction of traffic calming measures (e.g. speed humps and chicanes).

This study is primarily interested in new 20mph limits (signed only), where the speed limit was reduced from 30 mph to 20mph following implementation of the main area-wide scheme, and where there is no pre-existing traffic calming in place.

1.3. Strengthening existing research

Much of the evidence on the effectiveness of 20mph limits relates to zones implemented in the 1990s / early 2000s (e.g. Webster, D and Mackie, A, 1996; Webster, D and Layfield, R, 2003; Allott and Lomax, 2001). The schemes examined typically covered a few kilometres of road length, where average vehicle speeds were well above 20mph before the speed limit was taken down to 20mph (referred to as ‘before speed’), and were implemented to address location-specific safety issues.

These schemes are very different to the 20mph (signed only) limits considered in this study, which are larger area-wide initiatives⁴, with lower before speeds (closer to 20mph), and have typically been introduced to deliver an area-wide change rather than address location-specific issues. Existing evidence on these types of 20mph limits (e.g. Wernsperger and Sammer, 1995; Burns, 2001; Fischer, 2010; Atkins, 2010; Pilkington, et. al, 2018) is more limited and tends to be based on data covering short periods following scheme

⁴ The two smallest case study areas include 6kms and 14kms of new 20mph limit, Other case study areas are much bigger.

implementation, with variable accounting for background trends in speed, safety and mode use which are unrelated to the change in speed limit.

This study seeks to strengthen the evidence base regarding the effectiveness of 20mph (signed only) limits. Most published research to date has focused on evaluating individual schemes (e.g. Graz in Austria, Portsmouth, Bristol). In contrast, this study combines evidence from 12 case study schemes, comprising over 700kms of new 20mph (signed only) limits, and uses data from comparable locations where 20mph limits have not been introduced to control for background trends. It brings together a wider range of qualitative and quantitative evidence sources, to provide robust evidence on observed and perceived outcomes following the implementation of 20mph (signed only) limits.

The primary focus is on changes relating to perceptions, driving behaviour, and vehicle speed, along with an early assessment of change in collisions and casualties (between 17 and 44 months post implementation, depending on the case study in question). Detailed statistical analysis involving data for comparator areas has been undertaken to estimate the likely contribution of 20mph limit implementation to observed changes in vehicle speed and road safety.

Evidence on change in mode use is based on self-reported change identified through questionnaire surveys and an investigation of associated factors.

A clear distinction is made between perceived and actual outcomes, which often differ. Both are valid, but in different contexts. For example, perceived reduction in speed is more important in terms of walking and cycling levels, while actual speed is of key importance in terms of injury severity as a result of a road collision.

This study has not sought to collect primary data on wider impacts relating to the local economy, the environment (greenhouse gas emissions, air quality, noise) and health. Existing empirical evidence is weak or inconclusive, and there remains an evidence gap regarding the impact of 20mph limits on these areas.

1.4. Methodology and data sources

The evidence has primarily been drawn from twelve case studies, comprising a variety of area types (city/metropolitan to small town locations), different road types (in terms of geometry, land-use, on-street parking, etc.), and scale (small-scale and area-wide). These 'core schemes' inform both the process and impact evaluation elements of the research.

A further three case studies cover local authorities that have chosen not to implement a 20mph limit scheme ('no schemes'), and are used to understand the barriers and considerations behind such decisions.

In addition, three comparator areas are used to identify background trends in speeds on 30mph roads with similar characteristics to the 'core schemes'; and regional-based data is used to identify background trends in collisions and casualties on similar 30mph roads.

Table 1. Summary of 'core' case study schemes

Category	Case study schemes	
Predominantly residential schemes – small scale standalone , covering an individual neighbourhood (two schemes):	Walsall (Rushall)	Winchester (Stanmore)
Predominantly residential schemes – large scale area-wide schemes , covering a substantial portion of the town or city in question (eight schemes):	Liverpool (Area 7) Liverpool (Area 2) Middlesbrough Calderdale (Phase 1)	Nottingham (Bestwood) Brighton (Phase 2) Portsmouth Chichester
City or town centre and adjacent residential areas (two schemes):	Brighton (Phase 1)	Winchester (City Centre)

Eleven of the core case studies comprise schemes implemented between March 2012 and June 2015. The twelfth scheme (Portsmouth) was implemented before 2010, allowing the longer-term trend in vehicle speeds to be observed.

The schemes involved lowering the speed limit from 30mph to 20mph through signing and road markings, and supporting community engagement activities to raise awareness and encourage support. None of the schemes involved the introduction of physical traffic calming measures or changes to the street design.

The research collates findings from the following evidence sources:

- Face-to-face questionnaire surveys with 2,170 residents living in or near the new 20mph limits (drivers and non-drivers) and 1,256 drivers living outside the case study areas (non-resident drivers).
- Online surveys with 1,655 cyclists and 352 motorcyclists nationwide.
- In-depth interviews with 177 non-resident drivers.
- Nine focus groups with residents and specific user groups (cyclists, young drivers, parents).
- Interviews with approximately 60 local stakeholders (officers, councillors, police, health, bus operators, interest groups).
- Analysis of speed outcomes based on GPS vehicle data (measuring area-wide journey speeds), and spot speed data (measuring instantaneous speeds) collected by local authorities⁵.
- Analysis of safety outcomes based on personal injury collision data recorded by the Police (referred to as STATS19 data).

Theory of change approach – The process of data collection, analysis, interpretation and reporting has been informed by a theory of change (or logic map) which describes the assumed process by which 20mph speed limits are intended to deliver changes in traffic speed and casualty rates, influence travel behaviour, and lead to associated environmental, health, community and economic benefits; along with consideration of enablers and barriers to delivery and the wider context. The theory of change can be thought of as a set of underlying hypotheses which are tested throughout the research, drawing on the available data to determine the extent to which there is evidence to support the intervention logic. In general, greater weight has been given to quantifiable data sources which provide greater certainty about the strength and scale of the outcome. However, the qualitative sources play a valuable role in explaining the context, exploring associated issues, and capturing the outcomes relating to specific user groups.

A baseline logic map was prepared during the study scoping stage, based on existing published research and interviews with national stakeholders. This mapped the *possible* causal pathways from the implementation of a generic 20mph limit scheme in order to deliver scheme objectives in line with the Department for Transport's Circular 01/2013 (Setting Local Speed Limits), and identified evidence gaps. Feedback was then sought from local case study stakeholders and three separate maps were developed to demonstrate the different causal pathways for the different scheme types: predominantly residential schemes (small scale); predominantly residential schemes (area-wide); and predominantly city centre schemes. The detailed logic maps are set out in Figures 3-5 of the Process and Impact Evaluation Technical Report.

Comparator analysis – To strengthen the evidence relating to changes in speed and collisions / casualties, data for comparator areas has been used to compare case study trends with background trends on 30mph roads with similar characteristics to the case study areas. This provides a more robust methodology than a simple before and after analysis, and provides evidence on the extent to which case study changes can be attributed to the introduction of 20mph limits. It should be noted that for practical reasons it was only possible to obtain speed data for three comparator areas, each covering a 20km² area. Collision / casualty data is more readily available, enabling a much larger number of comparator areas to be identified covering 8,568km². For context, the case study areas included in the comparator analysis cover a combined area of 110km².

Statistical reliability – The evidence presented in this report needs to be considered in the context of its statistical reliability. The term “significant” is only used in this report when referring to **statistical significance** (i.e. the likelihood that a relationship between two or more variables is caused by something other than chance). The report only refers to changes which are statistically significant, unless otherwise stated.

⁵ GPS data provided by TomTom measures journey speed across the case study areas. This is the effective speed of the vehicle on a journey between two points and is the distance between the two points divided by the total time taken for the vehicle to complete the journey, including any stopped time. In contrast, spot speed surveys measure the instantaneous speed of a vehicle at a series of specified locations.

1.5. Case study descriptions

The case study schemes comprise a mix housing types and ages, carriageway and road widths, and levels of on/off-street parking.

The two small-scale residential schemes both comprise a blanket 20mph limit, covering all roads within the scheme area.

The area-wide residential schemes cover most roads within the town / city, but none have a blanket 20mph limit in place. Strategic routes and roads meeting other specific criteria are excluded.

The two city centre schemes both comprise a blanket 20mph limit (including more strategic A and B-class roads with higher traffic flows). Brighton Phase 1 is part of an area-wide scheme which covers the whole of the city of Brighton. Phase 1 covers the core city centre area and the adjacent residential neighbourhoods. Winchester City Centre scheme comprises a blanket 20mph limit across all roads within the historic city wall.

1.6. Policy and legislative context

Setting Local Speed Limits (DfT Circular 01/2013) – Before 1991, local authorities were not permitted to set speed limits below 30mph (according to the Road Traffic Regulation Act 1984). Since then, amendments to the Act and a number of Department for Transport Circulars (providing advice to transport professionals and local councils) have allowed reduced speed limits to be applied in appropriate circumstances.

In 2013, DfT provided revised guidelines on the setting of local speed limits (**DfT Circular 01/2013**). The guidance says that authorities can set 20mph speed limits in areas where local needs and conditions suggest the current speed limit is too high. The guidance encourages traffic authorities to consider introducing more 20mph limits and zones over time. It states that where there is expected to be a positive effect on road safety and a generally favourable reception from local residents, traffic authorities are able to use their powers to introduce 20mph speed limits or zones on:

- major streets where there are, or could be, significant numbers of journeys on foot, and/or where cycle movements are an important consideration, and this outweighs the disadvantage of longer journey times for motorised traffic; and
- residential streets, where the streets are being used by people on foot and on bicycles, there is community support, and the characteristics of the street are suitable.

It recommends that local authorities consider 20mph speed limits over larger areas comprising a number of roads where mean speeds are already 24mph or less.

It also states that successful 20 mph limits are generally self-enforcing (i.e. the existing conditions of the road together with measures such as traffic calming (in the case of zones), signing, publicity and information), lead to a mean traffic speed compliant with the speed limit; and to achieve compliance there should be no expectation on the police to provide additional enforcement beyond their routine activity, unless this has been explicitly agreed.

Traffic authorities are asked to have regard to this guidance, although it is not mandatory.

Other key legislation – In addition, the Traffic Management Act 2004 places a duty on local authorities to balance the needs of all road users in securing the expeditious movement of traffic.

Under the Health and Social Care Act 2012, local authorities now have public health responsibilities; of relevance to 20mph limits given the strong links between road safety and public health.

The Equality Act 2010 requires local authorities (amongst others) to provide equality of opportunity between people who share a protected characteristic and those who do not. Of particular relevance to 20mph limits are children, older persons, those with disabilities, and women, who are more likely to be dependent on walking rather than car use, or seen as more vulnerable road users.

In Wales, the Well-being of Future Generations (Wales) Act 2015 requires public bodies to think more about the long term, work better with people and communities and each other, look to prevent problems and take a more joined-up approach.

Police speed enforcement policy – Police guidelines on speed enforcement are set out in ACPO⁶ Speed Enforcement Policy Guidelines 2011-2015: Joining Forces for Safer Roads⁷.

The guidelines state that 20mph speed limits or zones should “*be part of a package of other measures to manage speed which includes engineering, visible interventions and landscaping standards that respect the needs of all road users and raise the drivers’ awareness of their environment, together with education, driver information, training and publicity*” ... “*It is for local authorities to appropriately sign and if necessary engineer a limit, leaving the police to target the deliberate and persistent offenders, together achieving the very highest level of compliance and safety for other road users*”.

Roll-out of 20mph (signed only) limits – Over the last few years, a large and growing number of authorities have implemented small-scale and area-wide 20mph limits, responding to guidance in DfT Circular 01/2013 that traffic authorities consider the introduction of more 20 mph limits in primarily residential areas and other town / city streets with high pedestrian and cyclist movements.

In 2016, the Department for Transport asked all local authorities to provide details of the length of road with a permanent 20mph limit (signed-only or with physical calming) in their local authority area. Across the 39 authorities responding, the length of 20mph road had increased from 1,474kms in 2010 to 4,787kms in 2015, an increase of 225%⁸.

Advocacy for wider roll-out of 20mph limits – A number of organisations have called for the wider roll-out of 20mph limits:

- Most recently, the International Transport Forum at the OECD published its report on Speed and Crash Risk (April 2018). This calls for 30km/h (~20mph) speed limits in built up areas where there is a mix of vulnerable road users and motor vehicles; and advocates a ‘safe system’ of road design and speed limits that can accommodate unavoidable human error without leading to death or serious injury.
- The World Health Organisation (WHO, 2017) recommends 20mph limits as best practice in residential areas, and states that ‘a safe speed on roads with possible conflicts between cars and pedestrians, cyclists or other vulnerable road users is 30kmh/20mph’.
- The Scottish Parliament is to consider a Member’s Bill to replace the current national 30mph for street-lit roads with a 20mph default limit⁹.
- The National Institute for Health and Care Excellence has published various guidance recommending that local authorities consider implementing 20mph limits on appropriate roads to reduce road injuries (NICE, 2010) and tackle air quality (NICE, 2017); and noting the potential role of 20mph zones in helping to restrict vehicle speed as part of a strategy to promote walking and cycling (NICE, 2012).
- The RAC Foundation (motoring research organisation) supports “the introduction of 20mph limits wherever there is an over-riding road safety case”, but states that “the mobility and productivity needs of road users must also be taken into account”¹⁰.
- PACTS (Parliamentary Advisory Council for Transport Safety) supports lower speed limits in urban areas but stresses that it is important that these deliver real benefits and not the illusion of change^{11,12}.

A number of lobby and interest groups also exist to promote the implementation of 20mph limits; others promote a more cautious approach or are opposed to 20mph limits and zones.

⁶ The Association of Chief Police Officers (ACPO) was replaced in 2015 by a new body, the National Police Chiefs' Council.

⁷ The latest version can be found at: <http://library.college.police.uk/docs/appref/ACPO-Speed-Enforcement-Guidance.pdf>.

⁸ The local authorities with the greatest coverage of 20mph limits were: Sefton (800kms in 2015); Wigan (750kms in 2015); Nottingham (580kms in 2015); Southwark (336kms in 2015); Camden (258kms in 2015).

⁹ Proposed Restricted Roads (20mph Limit) (Scotland) Bill. Consultation by Mark Ruskell MSP, Member for Mid Scotland and Fife. May 2017.

¹⁰ RAC Report on Motoring 2017.

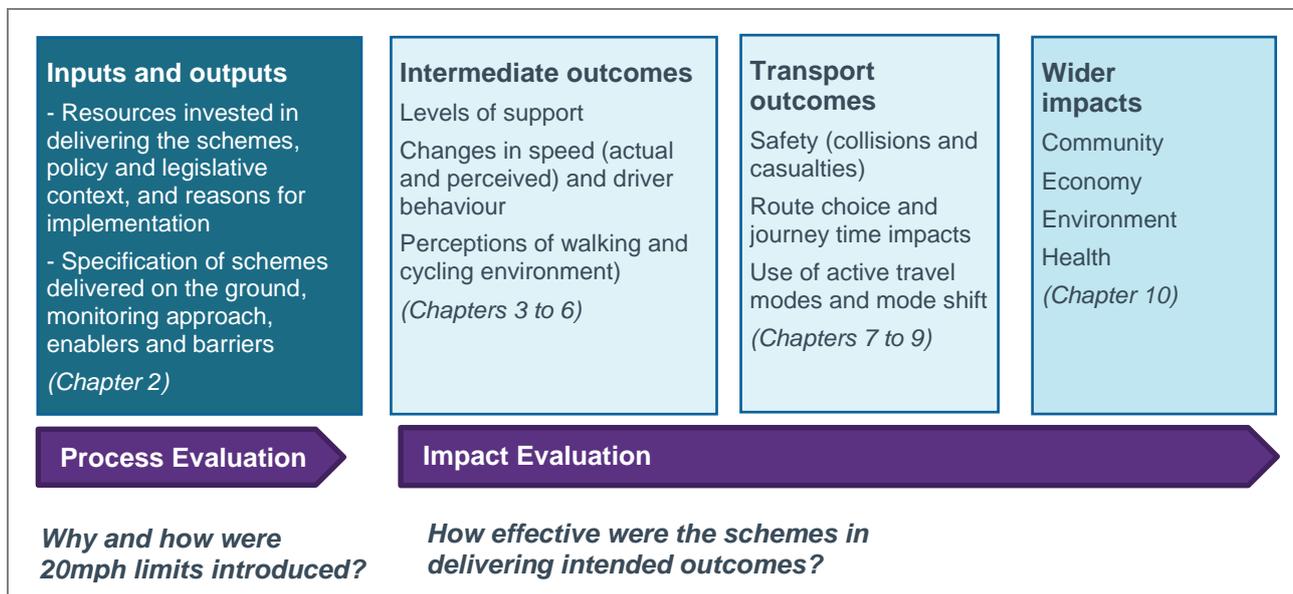
¹¹ Response by PACTS to consultation by Mark Ruskell MSP, Green Party, on a Members Bill to change the default speed limit in built up areas across Scotland from 30mph to 20mph (August 2017).

¹² Cycling and Walking Investment Strategy (CWIS) safety review – PACTS response (May 2018).

1.7. Structure of report

As described above, this report is structured around a **theory of change model** which describes the assumed process by which 20mph speed limits are intended to deliver change (see Figure 1).

Figure 1. Structure of report, based on input-output-outcome/impact theory of change model



2. Why and how were 20mph limits introduced?

2.1. Introduction

This chapter examines the motivations and objectives for implementing 20mph limits, how were schemes expected to achieve their outcomes, the scheme delivery process, enablers and barriers to delivery, and lessons and considerations for decision-makers.

2.2. Motivations and objectives for implementing 20mph limits

The key motivations behind the case study schemes can be categorised as transport-related, community or political, and health-related; with most schemes driven by a combination of these factors (listed in Figure 2).

Figure 2. Key motivations for implementing 20mph limit (signed only) schemes



In general, 20mph limit schemes provide an opportunity to address a wide range of policy areas in what is perceived to be a low-cost manner. The majority of schemes therefore have a range of objectives which span road safety, promotion of active travel modes, perceived quality of the environment, health and wellbeing, and community benefits. The most common objectives are focused around community and health themes. Accident reduction is not a key driver behind many of the case study schemes.

2.3. How did stakeholders expect schemes to achieve their outcomes?

The logical process by which local stakeholders expected 20mph schemes to achieve their outcomes is set out in the logic maps in Figures 3-5 of the Process and Impact Evaluation Technical Report.

In summary, local stakeholders expected speed reductions and compliance to be achieved through a self-enforcement process, whereby, the majority of drivers adhere to the limit because they perceive 20mph to be an appropriate speed for the road environment and conditions. This then encourages or enforces other drivers to adopt a similar speed. They considered that providing a sufficient number of drivers actively comply, the approach should be effective in reducing average speeds and preventing excessive speeds, particularly where volumes of traffic are sufficiently high for this to happen.

Stakeholders hoped that over time driver behaviours and attitudes will change and compliance with 20mph limits will become the norm. However, many stakeholders were sceptical about the likely scale of change, as many drivers were already travelling close to 20mph, and proactive enforcement activity was expected to be limited.

Stakeholders then expected a reduction in casualty numbers and severity to be achieved through a reduction in vehicle speeds (particularly those travelling fastest) and increased driver awareness of those walking and cycling. Walking and cycling was expected to increase as residents perceived the street environment to be safer due to vehicles moving more slowly.

These changes were expected to reduce the proportion of trips made by private vehicle, smooth the flow of traffic (reducing stop-start driving), and reduce congestion; particularly in congested areas. Noise benefits were expected to come from a reduction in average and excessive vehicle speeds, but there was uncertainty about whether lower speeds alone would improve air quality.

Health benefits were expected to come from fewer road casualties and an increase in active travel. Safer and more attractive local environments were expected to encourage more social interaction. Shopping and leisure activity were also expected to increase, especially where a scheme forms part of transport, public realm and other development initiatives to promote a city centre or commercial area.

Stakeholders generally anticipated that any adverse impacts would be minimal. The potential for slower journey times for some private and public transport journeys was acknowledged but expected to be small as speeds were already in the low 20s on many roads, most schemes excluded strategic routes, and the roads affected were typically at the start or the end of most journeys (not affecting the main part of the trip).

2.4. Scheme delivery process

The principal stages for implementing 20mph limits are scheme design and specification; consultation and engagement with the public and stakeholders; statutory Traffic Regulation Order process; implementation of the limit; supporting measures to encourage compliance; and monitoring and evaluation (Figure 3).

None of the schemes has changed substantially since implementation.

Key delivery partners – The design and delivery of the case study schemes was led by the relevant local authority in all cases (generally the highway authority). In most cases the local authority was supported by other partners, including the Police, and in a small number of case studies, the Primary Care Trust. Local authority officers also worked with schools and other public sector organisations, pressure groups, community groups, and local businesses as part of wider community education and awareness initiatives. One authority (Liverpool) commissioned a public engagement company to develop and deliver a public engagement plan for local residents.

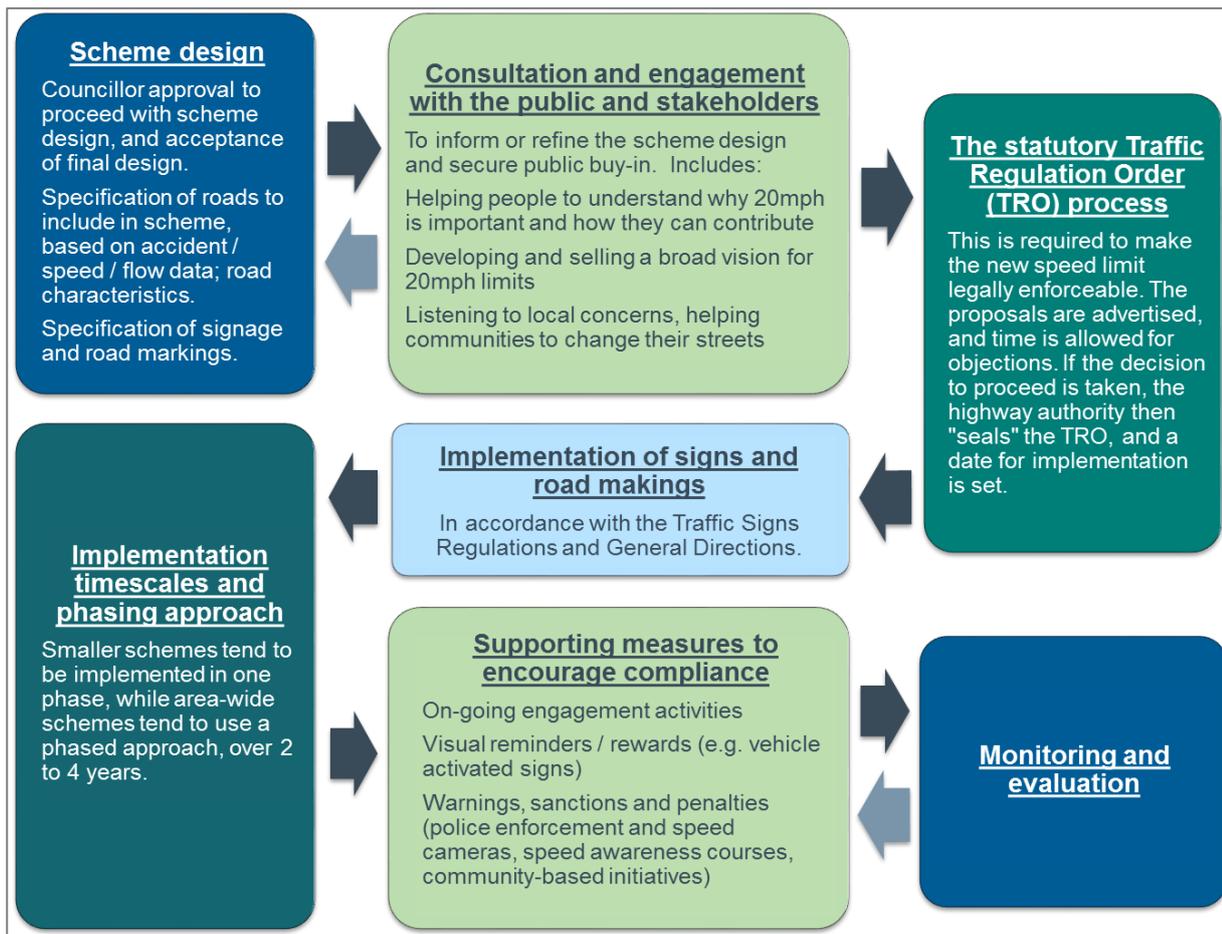
Costs and funding sources – The majority of schemes were funded from local authority transport budgets – generally the Local Transport Plan fund, but also the Local Sustainable Transport Fund. Two schemes also had substantial contributions from the health sector. In one case the local authority's health and wellbeing department funded 40% of the scheme cost via a ring-fenced grant from the Department for Health, and in another the local Primary Care Trust funded 40% of the scheme cost (focused on the public engagement element). A further scheme was funded using planning obligations from local developers¹³.

The cost of the schemes ranged from £10,000 to £1.7 million, with larger schemes generally having higher implementation costs. The most costly elements were staff costs (mentioned by two of the six authorities providing information), and costs associated with signs and carriageway markings, including sign production, road painting, and labour costs (mentioned by four of the six authorities providing information).

Estimates of £250,000 and £300,000 were given for consultation and engagement activities in two of the larger area-wide schemes, with costs relating to the whole city rather than just the area covered by the case studies.

¹³ Planning obligations, also known as Section 106 agreements (based on that section of The 1990 Town & Country Planning Act) are private agreements made between local authorities and developers and can be attached to a planning permission to make acceptable development which would otherwise be unacceptable in planning terms.

Figure 3. Delivery process for case study schemes



2.5. Enablers and barriers to delivery

Local authority stakeholders (mainly council officers) were asked to identify and rank enablers and barriers which affected the extent to which schemes were delivered to the anticipated quality, programme, and cost, and were accepted by the public. As shown in Figure 4, the enabler cited most often was 'early engagement and buy-in from stakeholders', while the barrier most frequently mentioned was 'limited funding and staffing resources'.

Figure 4. Factors affecting scheme delivery including related issues and consequences

Enablers
<ul style="list-style-type: none"> • Early engagement and buy-in from other stakeholders, including cross-party support from local councillors (mentioned for 8 case studies, most important enabler in 3): <ul style="list-style-type: none"> - Helps to minimise objections from the local community and businesses (crucially at TRO stage), secure support in scheme delivery from potential partners, enables the scheme to be delivered quickly, and increases public acceptance of the new limit. • Clear articulation of scheme rationale, objectives, and outcomes (mentioned for 6 case studies): <ul style="list-style-type: none"> - To secure buy-in from the community and address questions from stakeholders and the public. • Tailoring the scheme to local circumstances (mentioned for 4 case studies, most important enabler in 2): <ul style="list-style-type: none"> - Also important in terms of securing public support. - Includes locating signs where they are clearly visible, appropriate frequency of repeater signs and size of carriageway roundels, appropriate decisions about roads to include / exclude, and integration with other local initiatives and campaigns relating to transport and other policy areas. • Vocal and active pro-scheme campaign group (mentioned for 3 case studies, most important

enabler in 1):

- To reinforce consultation and engagement activities of the local authority and other key stakeholders.
- **Other initiatives focused on safety, active travel, health and well-being, and the environment (complementary initiatives)** (mentioned for 3 case studies):
 - Provides an opportunity to combine consultation and engagement activities and reinforce messages about safety, active travel and associated wider impacts.
- **Phased but efficient implementation of large area-wide schemes** (mentioned for 2 case studies):
 - Provides opportunity to spread resources and costs, apply lessons learned and demonstrate early successes to the public. However, prolonged timescales between consultation / engagement and implementation can cause public confusion and uncertainty, and increase costs if engagement activities need to be repeated.
- **Guidance and policy documents from other policy areas** (mentioned for 1 case study)
 - To demonstrate the role 20mph limits can play in delivering wider benefits.

Barriers

- **Limited funding and staffing resources** (mentioned for 9 case studies, most important barrier in 4):
 - Reduced availability and skillset of staff to support prolonged design and delivery phase.
 - More funding would have enabled more pre-scheme engagement to ensure residents understood why schemes were being implemented and to reduce opposition.
 - Planned monitoring and engagement activities had to be substantially reduced in a number of cases, due to budget cuts, failure to clearly identify and secure funding at the outset, and cost increases due to the need for additional engagement and to address objections received through the TRO process.
 - Skills gap relating to the design and delivery of behaviour change campaigns.
- **Scheme opposition** (mentioned for 8 case studies, most important barrier in 1):
 - Public opposition to schemes was generally low, but in a few areas anti-lobby groups hampered efforts to secure public support, prolonged delivery and increased pressure on staff resources.
 - Concerns focused on the impact of the scheme on journey times, issues of sign clutter, and whether the scheme represented good use of public money.
 - In the case of one of the 'no scheme' areas, a strong, well-organised anti-20 mph campaign resulted in the proposed scheme not going ahead. The local authority promoting the scheme was not able to provide evidence to clearly demonstrate the scheme rationale, objectives and outcomes, and ultimately were not able to secure buy-in from key stakeholders. The scheme had been proposed by a section of the local community, following the favourable outcome of a 20mph consultation exercise for a nearby town.
- **Confusion about the enforcement role of the Police amongst the public and in the media** (mentioned for 8 case studies, most important barrier in 1):
 - Misinterpretation of ACPO Speed Enforcement Policy Guidelines (2011-2015) by the media and others, with reports that the Police would not be undertaking any enforcement activity. Hampered efforts to secure public support.
 - What the Police say locally about enforcement can be important in how schemes are perceived.
- **Political change** (mentioned for 3 case studies, most important barrier in 1):
 - Political change and the involvement of newly elected councillors can cause programme delay, due to a need to review proposed schemes and take new views into account.
- **Lack of / confusing evidence regarding the benefits of 20mph limits** (mentioned for 2 case studies):
 - Difficult for local authorities to clearly justify the scheme and demonstrate the benefits to the public and other stakeholders.
 - In the case of one of the 'no schemes' the local authority's current policy is not to implement any area-wide 20mph limits, as available evidence is seen as insufficient to provide a clear articulation of the rationale, objectives, and outcomes. A 20mph limit is not expected to be effective in addressing the specific road casualty problem within the authority, and the evidence regarding active travel, health, community and environmental benefits is felt to be insufficient to

forecast local outcomes.

- **Issues relating to government leadership and guidance needed to justify schemes** (mentioned for 1 case study):
 - Lack of national road safety targets for collisions and casualties presented challenges in terms of justifying the scheme and providing a context for the outcomes.
 - Perceived need for a well-publicised national campaign on the benefits of 20mph limits, to help reinforce messages about driving at an appropriate speed in residential areas (for example, as part of DfT's *Think!* road safety speed campaign).
- **Practical delivery issues** (mentioned for 4 case studies):
 - Time consuming and resource intensive nature of advertising the TRO; delays associated with a change of local authority contractor and challenging winter weather conditions which stopped work to install signposts; and length of time to procure and install signs and road markings.

Case study example – Consultation and engagement approach

Liverpool City Council adopted a 'consultation first' approach to scheme design and delivery, which sought to put the people of the city at the heart of the campaign. A public engagement company was commissioned to develop a public engagement plan for local residents. This included high visibility engagement activities designed to raise awareness of the 20mph policy, build support for the initiative and encourage a culture of self-enforcement. Only once these events had been delivered and relationships built with the communities did the legal process of Traffic Regulation Orders follow.

At the outset, the council started a process of formal consultation with key stakeholders such as councillors and Merseyside Police.



At the same time, the Council set about identifying local influencers who could 'own' the 20mph campaign at a local level, who would understand where opportunities may exist to deliver promotion events, and who could quickly connect with the public. These included local councillors, key staff from local community hubs and grass root organisations, and local celebrities. Working with these groups, they established a series of events and activities which highlighted the campaign's purpose. These activities sought to develop a sense of community ownership of the 20mph scheme before the new limits were put in place.

The Council also worked closely with lead partners and citywide stakeholders to present the campaign as one which had a broad public sector base of support. This involved aligning engagement activities with those of the council, the emergency services, schools, health providers and road safety organisations.

In addition, a number of high visibility co-production engagement activities were developed with community organisations, schools and public services, based on their own ideas. Examples include:

- a mock trial of a speeding driver with the lower house of the School's Parliament, involving the Council and Police;
- a debate with learner drivers, involving the Council and the Police;
- an activity with young people and the public to develop a large artwork; and
- Kids Court – an activity which took a previously successful scheme developed by the Police and integrated a programme of engagement with a local school and community.

Various marketing and communication activities were undertaken, including substantial coverage in the local media and a feature on the BBC.

Social media was widely used, with updates provided via Facebook and Twitter, and via a blog on the Council website.

These activities were all integrated under a common brand and logo, which was widely promoted. For example, local businesses and organisations were encouraged to display the campaign logo on company vehicles. This included the Royal Mail and the local contractor responsible for implementing the scheme.

Post implementation – The Council continued to run the campaign post implementation to reinforce messages about the speed compliance and the benefits of 20mph limits.

A Roadside Education Programme, supported by the Police and local schools, was introduced whereby drivers travelling in excess of the speed limit were invited to take part in various education activities, rather than taking points on their licence. These included a roadside education bus, where they could go inside and watch a video explaining the differences of travelling at 20mph rather than 30mph; and a 'Kids Court', where a court situation was played out with children from local schools interrogating the offender. The Council would like to have continued these interventions but are currently unable to due to resource constraints.

However, regular updates are provided on social media, regarding the latest 20mph news and events. This includes interviews with taxi drivers about why they support the 20mph limit, news about local businesses actively supporting the limit, interviews with business and community leaders about their daily commute on foot and by cycle, and information about cycle routes throughout the city.



Images taken from: www.the20effect.com

2.6. Lessons and considerations for decision-makers

The findings of the process evaluation have identified a number of lessons and considerations for decision makers.

Clarity around strategic case, objectives and outcomes - Only a small proportion of case study schemes were specifically identified in the local authority's Local Transport Plan and related strategies. In addition, scheme objectives were often not clearly documented, with most authorities setting out the intended outcomes in a more descriptive manner on their website. Local authority officers often did not have a clear understanding of the relationship between lowering the speed limit and impacts associated with congestion, air quality and active travel (i.e. how exactly these outcomes might occur, in what contexts, and the scale of likely change), reflecting the limited research evidence available at the time.

Appropriate consideration and articulation of the strategic rationale for the scheme, the objectives to be delivered, and intended outcomes is a key requirement for ensuring any intervention is effective and delivers maximum value. In the case of 20mph limits, such an approach is important in terms of:

- understanding the extent to which schemes can contribute to policies relating to transport, health, environment, the local economy and local communities;
- identifying opportunities to link the scheme with related transport and wider policy initiatives, as part of an integrated strategy to address broader policy objectives;
- identifying and ensuring buy-in from appropriate partners (including funding);
- establishing a common understanding of scheme benefits and what success looks like; and
- ensuring the right outcomes are monitored to determine whether the scheme has been successful.

This study substantially strengthens the evidence base that policy makers are able to draw on, but empirical evidence regarding wider impacts (relating to the local economy, the environment and health) is weak, inconclusive, or complex (particularly regarding air quality) and there remains an evidence gap regarding the impact of 20mph limits on these areas.

Integrated approach – 20mph schemes have the potential to deliver a wide range of benefits, and in the longer term, health, environmental and community benefits could be greater than the more obvious road

safety benefits. This provides an opportunity for scheme promoters to work and engage with a range of policy and interest groups; and the most effective schemes are likely to be those which are based on a broad integrated policy agenda (involving health, environment, urban planning, emergency services, education, community representatives, etc.). Longer-term 20mph schemes which are supported by complementary transport, health, environment and community policy and interventions are likely to deliver greater benefits.

A scheme driven by traffic engineers may be seen as anti-driver, while one involving multiple agencies and policy agendas is more likely to achieve community support. The involvement of Public Health, for example, can give recognition and credibility to the long-term health benefits of schemes, which the public may find more persuasive than a simple focus on speed reduction.

Integrating engagement activities with interventions in other policy areas can help to maximise exposure and reinforce messages about safety, active travel and associated benefits. A multi-agency approach can also help leverage in funding and resources, including expertise in behaviour change. In London, lower speeds are at the heart of Transport for London's Healthy Streets Approach, which has been integrated into all Mayoral policy and strategy documents.

Involving the Police as part of an integrated team helps put the role of formal enforcement activity into context. It demonstrates that enforcement is part of a package of measures to encourage compliance, based largely on education and awareness to secure public support.

At a transport level, authorities should consider 20mph limits as part of a wider initiative to improve road safety, promote walking and cycling and reduce congestion, and improve air quality. Furthermore, implementing a 20mph limit can create opportunities for other interventions. For example, in Portsmouth a network of quiet routes has been introduced, making use of quieter 20mph roads and cycle paths, more suited to less confident cyclists.

Tailoring the scheme design to local circumstances – It is important that the scheme design (in terms of the scheme boundary, roads included / excluded, and positioning of signs and road markings) reflects local circumstances, objectives and aspirations, if the scheme is to be supported by the local community.

Urban features and road characteristics can be used to create a different look and feel in 20mph areas. However, when designing schemes consideration also needs to be given to providing continuity in speed limits (i.e. avoiding frequent changes from 20mph to 30mph), local community aspirations, and likelihood of compliance through self-enforcement. The appropriate balance will depend on the specific objectives of the scheme and supporting interventions, including the relative weight given to reducing collisions / casualties, encouraging active travel, and delivering wider policy objectives relating to health, environment, the local economy and local communities.

Signage requirements – The Traffic Signs Regulations and General Directions (TSRGD) was updated in 2016¹⁴, giving local authorities more flexibility to make their own decisions on how many signs and road markings are needed to inform drivers about 20mph limits. This provides scope to substantially reduce sign clutter and implementation / maintenance costs. However, signage must still comply with the Regulations or be specially authorised, be sufficient to encourage compliance and give reasonable grounds for a case to be upheld in court if a driver were caught speeding.

The experience of some case study authorities is that additional signing has been required post implementation to ensure drivers are sufficiently aware of the limit. A cautious approach should therefore be taken to adopting a minimal signing strategy, at least in the short to medium term.

The Scottish Parliament is considering a Member's Bill to replace the current 30mph national speed limit for street-lit roads with a 20mph default limit¹⁵. If successful, the promoters of the Bill expect that over time this would substantially reduce the need for signage, in the same way as there are currently limited signs and road markings to indicate the default 30mph limit. They also expect that over time the signing requirements in city-wide schemes could reduce, through increased driver awareness and acceptance, particularly where a more blanket approach has been adopted.

¹⁴ After the case studies considered in this study were implemented.

¹⁵ Proposed Restricted Roads (20mph Limit) (Scotland) Bill. Consultation by Mark Ruskell MSP, Member for Mid Scotland and Fife. May 2017.

The importance of effective consultation and engagement – Case study authorities emphasised the importance of effective consultation (pre-implementation) in terms of establishing local support, ensuring smooth delivery (particularly regarding the TRO process), and encouraging changes in driving behaviour.

Critically, many of the consultation approaches were designed to put the community at the heart of the process, with local residents encouraged to take responsibility for their local environment and drive change. This can be achieved through various approaches, including:

- focusing on wider community benefits (safety, quality of life, health, etc.) rather than speed reduction;
- adoption of a common brand and logo, which stakeholders and the local community can promote;
- questionnaires to affected households – most case study authorities undertook questionnaire surveys to obtain information on travel patterns and mode use, views on local speed-related issues, and support for 20mph limits, but the questionnaires were as much about getting the public involved as obtaining information;
- the use of local ‘influencers’ or champions who own the campaign at a local level and are able to quickly connect with the public;
- activities with local schools (as a means of engaging with parents, and changing attitudes and behaviour through child-parent influence); and,
- use of social media to encourage dialogue and debate within the local community.

However, engaging with the community in a comprehensive manner is difficult, and interventions are quickly forgotten post implementation. Evidence from the residents’ questionnaires shows that only 29% could recall receiving any information about the schemes, and only 12% said they were aware of the consultation activities. The results show a clear lack of awareness or recall (i.e. they may not have read the consultation material, may not have noticed it, or may have forgotten about it).

Engagement activity should be integrated with interventions in other policy areas to maximise exposure and reinforce messages about safety, active travel and associated benefits. Awareness and education campaigns should continue after the scheme has been implemented to encourage on-going compliance.

Engagement with young drivers – Within the case studies investigated there appears to have been relatively little focus placed on engagement with young drivers. However, this is the age at which driver habits and attitudes are formed, which may last into later life. In contrast to more experienced drivers, young drivers have not established their driving style in the context of a default 30mph limit and do not need to change long established driving habits. A specific focus on young drivers, nationally or locally, is therefore likely to be beneficial.

Appropriate skillset – The scheme design process for the case study authorities appears to have been led by transport planning teams, particularly road safety officers and traffic engineers. Consideration should be given to employing a wider set of skills to encourage integration with wider policy areas. This might include urban planners to encourage integration with public realm policy (focusing on the look and feel of 20mph roads); and health, education, environment and community representatives to enable engagement activities to be aligned and messages reinforced. Public engagement and behaviour change skills are of key importance. They represent areas where conventional transport planners may lack appropriate knowledge and training, and where specialist input is likely to be beneficial.

Public expectations need to be managed – A number of authorities commented that the delivery process had enabled the Council to demonstrate its ability to work with the local community and respond to residents’ concerns; and also had a positive impact in terms of creating a community spirit. However, they were also aware that it had raised expectations amongst the public regarding the Council’s ability to respond to other community issues, or take further action if speeds remain high.

Substantial revenue costs – Capital cost may be low, compared with other schemes, but revenue costs associated with pre- and post-implementation engagement, enforcement activities, and monitoring can be substantial. A number of case study authorities had to considerably cut back on these activities, as budgets had not been properly identified and/or sourced at the outset.

Monitoring – Post implementation monitoring is important in terms of identifying whether the objectives have been met, assessing the need for further intervention where there is concern, and to demonstrate the benefits of investment where there is success.

Resources should be budgeted for at the outset for monitoring and evaluation tasks. There may be a need for additional monitoring post-implementation, to respond to concerns from the public and councillors.

The monitoring approach should be tailored to the specific scheme objectives, proportionate to the scale of the scheme, and undertaken in a robust manner which provides confidence in the results and the extent to which they are likely to be due to the new 20mph limit. There should be clarity on the purpose of monitoring and how the results will be used (e.g. to justify spend to decision-makers, modify the scheme design, inform decisions about future policy, or identify need for further intervention).

A logic map approach, articulating the process by which the scheme is expected to deliver outcomes and wider impacts, can help identify the monitoring priorities. For example, where speed reduction is a key objective then data on observed speeds will be important; but where the scheme is focused on improving the attractiveness of the area for walking and cycling, then attitudinal surveys are arguably more informative.

Consideration also needs to be given to the context within which the scheme has been implemented, including the potential contribution of other policy initiatives and background trends (particularly in terms of speeds, collisions / casualties, and use of other modes).

The findings of the analysis should be clearly reported, and available for scrutiny by policy makers in the authority concerned and elsewhere. In general, the case study authorities were unable to provide a formal report setting out the findings of the monitoring data (within the timescales of this study). Some provided analysis spreadsheets, while others referred the study team to local authority papers prepared for Council executive/cabinet meetings, which provide a high-level summary of the results. In general, however, documentation of any monitoring and analysis of the results was limited. So, while the authorities generally collected a substantial amount of monitoring data, there is a question about whether the data has been used effectively.

Effective monitoring of wider impacts (e.g. health, environment, local economy and community) represents a particular challenge, given the complexity of the relationships being examined and the range of compounding factors involved. These potential benefits may be better examined centrally, through bespoke research studies, rather than at an individual case study level.

Further lessons and considerations regarding the monitoring of specific outcomes are set out in Section 5.13 of the Process and Impact Evaluation Technical Report.

3. Is there support for 20mph limits?

3.1. Introduction

This chapter examines the level of support for 20mph (signed only) limits amongst different user groups in the case study areas; why schemes are supported or opposed, and other factors influencing levels of support. The evidence is based on questionnaires with residents and drivers in the case study areas, interviews and focus groups with various road users in the case study areas, and national online surveys with cyclists and motorcyclists.

3.2. How do levels of support vary amongst user groups?

Evidence from the surveys shows high levels of post implementation support amongst cyclists (81%), residents (75%), and non-resident drivers (66%); but less support amongst residents in neighbouring 30mph areas (44%) and opposition from motorcyclists (29% supportive, 47% unsupportive).

The majority of residents (78%) and non-resident drivers (67%) felt that that 20mph was an appropriate speed for the area.

There is little call for the limit to be changed back to 30mph (12% support amongst residents and 21% amongst non-resident drivers).

There is majority support for 20mph limit applying at all times of day (78% amongst residents and 67% amongst non-resident drivers), rather than during peak or off-peak periods only.

Net support (% saying 'good idea' - % saying 'bad idea') amongst residents increased significantly after the implementation of the schemes (from +58% to +63%)¹⁶, suggesting that some pre-implementation concerns did not materialise or became more acceptable.

3.3. Why are schemes supported or opposed?

3.3.1. Overview

The majority of residents, non-resident drivers and cyclists (between 69% and 89%) perceive 20mph limits to be beneficial for residents, cyclists and pedestrians.

Cyclists are generally the most positive / supportive group, and two-thirds of cyclists (66%) agree that 20mph limits provide a safer environment for people cycling. Perceived benefits relate to the reduced speed differential between cars and cycles, as well as slower vehicle speeds. These factors are perceived to create a safer environment in general and reduce the severity of injuries, reduce the risk from overtaking, make it more acceptable to adopt a prominent position in the centre of the lane, give cyclists more time to manoeuvre, put cyclists under less pressure, and reduce the likelihood of drivers getting frustrated with cyclists. 20mph limits are also perceived to increase driver awareness and observance regarding cyclists, and give both parties more reaction time.

Most resident and non-resident drivers (72% and 69% respectively) agreed that 'the 20mph limit makes it more acceptable to drive at a lower speed'. However, there is some evidence of driver frustration with the new limit (identified by 48% of non-resident drivers); and only 36% of non-resident drivers agreed that 'it is safer to drive on these streets / in this area'.

Resident and non-resident drivers perceive the benefits of 20mph limits to be focused around safety, including safer environments around schools, safer crossing facilities for pedestrians (particularly for older people and those with disabilities), safer conditions for cyclists, and the possibility of fewer and less severe collisions. However, they are sceptical about the actual level of benefit delivered locally. Those participating in a young driver focus group reported that the slower limit enables them to build confidence, allows more

¹⁶ % saying 'good idea' increased from 71% to 75%.

reaction time, means that mistakes are more forgivable, and encourages good habits and attitudes which will be carried through to roads with higher limits.

In general, motorcyclists did not perceive 20mph limits to be beneficial for motorcyclists. Only 2% agreed that '20mph provides a safer environment for motorcyclists', and 49% perceived the limits to be detrimental for riders. Reasons include concerns about other vehicles overtaking, tail-gating or driving aggressively; an expectation / assumption that motorcyclists ride according to the conditions and will adjust their speed in response to the environment and potential hazards; and practical difficulties associated with riding at slow speeds, including lack of stability and difficulties getting out of first gear (requiring frequent use of the clutch), which can make complying with the speed limit challenging and uncomfortable .

The most common area of concern across all groups was around compliance, with most focus group and survey participants of the opinion that stronger enforcement measures are needed if 20mph limits are to be effective. There is a widespread view amongst the public that 20mph limits are not enforced, and the likelihood of being caught exceeding the limit is very small; and this is one reason why bigger reductions in speed have not been observed in scheme areas.

3.3.2. What other factors influence levels of support?

The evidence from statistical analysis shows:

- Significantly higher support amongst residents living in larger residential area-wide schemes (79% of residents); compared to small-scale residential (70% of residents) and city centre focused schemes (65% of residents). Focus group participants identified specific issues in the small-scale and city centre schemes (e.g. on-going concerns about high speeds on particular roads, and negative press coverage), which may have contributed to the findings. In both the city centre case studies, the schemes included more strategic A and B roads, alongside more minor streets. Amongst focus group participants, main roads were the most frequently mentioned road type considered unsuitable for a 20mph limit; although others felt that main roads tend to have more hazards and the benefits would be greater.
- Significantly higher support amongst residents living in non-car owning households. These households are most likely to appreciate any walking and cycling benefits (real or potential); and will be unaffected by any adverse impacts on drivers.
- Significantly higher support amongst those less likely to drive above the speed limit, as expected. This analysis was based on responses to questions about general propensity to speed.
- No significant association between level of support and familiarity with the area (frequency of driving through area). This analysis was undertaken to examine whether drivers are more supportive of local scheme where they are likely to see the benefits, compared to schemes further afield where they have less vested interest.
- Significantly higher support amongst those who perceive the schemes as having delivered relevant positive benefits - not a surprising finding. It should be noted however, that perceptions may not reflect actual outcomes.

In addition:

- Focus group participants expressed almost universal support for 20mph limits near schools, with some participants suggesting that 20mph limits should only be implemented close to schools, and that extending the limit across a wider area dilutes the impact on roads around schools. The counter-argument is that this approach endorses higher speeds on the rest of the network.
- Focus group participants were typically unsupportive of 20mph limits on main roads. However, others felt that main roads tend to have more hazards and the benefits would be greater.
- Evidence from stakeholder interviews and focus groups suggests that one or two high profile accidents (e.g. involving children or other vulnerable road users), rather than the accident rate in general, can drive substantial support.
- Strong communication, public engagement and advocacy amongst key stakeholders (including the press) play an important role in driving public support and creating positive perceptions about the benefits.

Finally, residents may view the 20mph limit more favourably simply because they are aware that there has been some change (regardless of how beneficial it actually is to them), and due to a sense that the local authority has taken an interest in them and their community.

4. How have speeds and driver behaviour changed?

4.1. Introduction

This chapter examines the extent to which drivers comply with the limit; changes in the profile of speeds; change in effectiveness of 20mph limits (signed only) over time; changes on neighbouring roads; and what residents and drivers say about their driving behaviour and the speeds in their local areas.

Journey speed and spot speed data (see textbox below) is used to estimate the change in vehicle speeds in case study areas. This is important as it has a direct impact on the number and severity of collisions, journey times, and vehicle noise and emissions.

Journey speed data – Journey speed is the effective speed of a vehicle on a journey between two points (e.g. from one end of a road to another). It is calculated by dividing the distance between the two points by the total time taken for the vehicle to complete the journey, including any stopped time. The data is derived from in-vehicle GPS devices which are connected or actively being used. Journey speed data has been purchased from TomTom for one year before and one year after the introduction of 20mph limits in each case study area. The dataset provides information on speeds across the whole network. Across the 12 case study areas, over 1,100kms of roads and 18 million vehicle kilometres (VKMs)¹⁷ of speed data has been analysed, including 3.1 million vehicle kilometres of data for new 20mph (signed only) limit roads.

Instantaneous speed data – Spot speed surveys measure the instantaneous speed of a vehicle as it passes a specified location, using inductive loops, radar devices or similar technology. Surveys capture data for every single vehicle passing the detection point, and more accurately represent 'free flow speed' if located in a suitable location. However, the surveys provide data for a limited number of locations only, typically for a 7-14 day period only. Local authority collected spot speed data has been obtained for nine of the case study schemes, covering 410 sites (of which 223 were located in Portsmouth).

Analysis metrics – The following metrics are used to examine how the profile of speeds has changed in the case study areas:

- **Average speed** – Measured using the median or mean speed. Analysis of journey speed data uses the median¹⁸ to measure average speeds, as this helps to dampen the impact of slow moving vehicles (e.g. vehicles slowing to allow an on-coming vehicle to pass). For the spot speed analysis, the mean¹⁹ is used to reflect the full range of instantaneous speeds. This is determined by adding all the data points in a population and then dividing the total by the number of points.
- **Fastest speeds** – Measured using the 85th percentile speed. This is the speed that 85 percent of vehicles do not exceed. Only 15 percent of vehicles go faster than this speed, and 85 percent go at or below this speed. It is regularly used in traffic engineering as a standard to set safe speed limits and in the design of roads.
- **Range of speeds** – Measured using the 15th-85th percentile.
- **Threshold speeds** – The proportion of all drivers travelling at less than 20mph, 24mph²⁰, and 30mph.

Both data sets have been filtered to enable a focus on new 20mph limits (signed only). Roads with pre-existing traffic calming (road humps, chicanes, etc.), existing 20mph limits (implemented before the main case study schemes) and higher speed limits have been separated out and analysed independently. Greater emphasis has been given to the journey speed data, as this provides information on speeds across the whole of the network, and a consistent format and comprises a very large sample size when aggregated

¹⁷ Vehicle kilometres (VKMs) are a measure of traffic volume that considers the total distance travelled by users rather than just the number of users. This is determined by multiplying the number of vehicles on a set of road segments by the corresponding length of the segments.

¹⁸ Denoted as the value lying at the midpoint of a frequency distribution of observed values.

¹⁹ Determined by adding all the data points in a population and then dividing the total by the number of points.

²⁰ This is the recommended threshold for fixed penalty notices or speed awareness courses in the ACPO Speed Enforcement Policy Guidelines 2011-2015. In addition, Circular 01/2013 suggests that where average speeds exceed 24mph the introduction of signage only is unlikely to lead to 20mph compliance.

across all case study areas. In addition, it is the most representative of the typical speed at which drivers travel along a road. Spot speed results are also presented for comparison. While spot speed data has the benefit of capturing the speed of every single vehicle passing the detection point, it is acknowledged that the surveys are typically conducted for short periods only and at a limited number of locations. Furthermore, feedback from case study authorities suggests that site locations can be biased towards busier and more important routes, and those where speeding has been reported as an issue or are expected to have a low level of compliance.

Analysis of journey speed data uses the median (denoted as the value lying at the midpoint of a frequency distribution of observed values) to measure average speeds, as this helps to dampen the impact of slow moving vehicles (e.g. vehicles slowing to allow an on-coming vehicle to pass). Use of the mean (rather than the median) would result in a much lower estimate of the average speed. However, for spot speed data, it is common practice to use the mean to measure average speed, to reflect the full range of instantaneous speeds. Spot speed data typically reports higher speeds than journey speed data, and mean spot speeds are higher than median journey speeds.

Questionnaire data is used to examine self-reported driving behaviour and perceptions. Drivers views about their own behaviour may help explain actual speeds; while perceptions about speeds are important in terms of the attractiveness of walking and cycling and views about the quality of the community environment.

4.2. Background context

Analysis of GPS journey speed data shows that a substantial proportion of drivers were already travelling at less than 20mph prior to the introduction of the new limits (44% in residential case study areas and 59% in city centre case study areas), and median before speeds were already close to 20mph (21.1mph in residential areas and 18.0mph in city centre areas). This suggests that the new limits have formalised a lot of the previous behaviour and a substantial reduction in speed is unlikely in these locations.

This trend reflects the high proportion of minor local roads within the case study areas: 67% and 53% of road length within the residential and city centre areas is classed as 'minor local road' with a before median speed of less than 20mph. Minor local roads²¹ are likely to be narrower roads, primarily within residential areas or estates (with a destination function only); where drivers may struggle to reach higher speeds due to parked cars, cul-de-sacs, or high volume of pedestrians in the area (e.g. outside a school).

The findings suggest that local authorities have broadly taken into account the guidance in DfT Circular 2013/01 (Setting Local Speed Limits) when deciding where to implement 20mph limits. This says that signed only 20mph limits are most appropriate where the mean speed is already below 24mph and introducing a 20mph limit on these types of roads is likely to lead to general compliance with the new limit.

4.3. To what extent do drivers comply with the limit?

Evidence from the journey speed analysis (Table 2) shows that following implementation, 47% of drivers in residential areas and 65% of drivers in city centre areas (equating to 51% across both categories) complied with the new 20mph limit, travelling at speeds of less than 20mph. Whilst a substantial proportion are exceeding the limit, the majority are travelling at less than 24mph (i.e. at speeds close to 20mph): 70% in residential areas and 86% in city centre areas.

The nature of the roads where the limits have been introduced means that lower speeds were already 'self-enforced'. Reducing the speed limit to 20mph has helped reinforce this process. There are now slightly more drivers travelling at speeds of less than 24mph (+5 percentage points in residential areas, and +7 percentage points in city centre areas), suggesting faster drivers have slowed down.

Compliance with the new 20mph limits is:

²¹ Case study roads have been classified using TomTom's Functional Road Classes, which provides a good proxy for the size and nature of each road. 'Minor local roads' are roads of minor connecting importance within a settlement, and roads that only have a destination function, e.g. roads inside living area, dead-end roads, alleys. 'Important local roads' are local connecting roads which provide access to settlements or parts of settlements, and the main connections within a settlement, where important through traffic is possible e.g. arterial roads within suburban areas, industrial areas or residential areas. 'Major strategic roads' are major roads used to travel between different parts of the country or region.

- higher in city centre areas, compared with residential areas;
- higher on roads with a median before speed of less than 20mph; and
- higher on 'minor local roads', compared with 'important local roads'.

Evidence suggests that within the case study areas, the character of the road has a bigger influence on driver speed than whether the limit is 30mph or 20mph. Changing the look and feel of the street (e.g. through road markings, landscaping, and roadside activity) may therefore result in higher levels of compliance.

Table 2. Proportion driving less than 20mph in case study areas (based on journey speed analysis)

Category	Before (30mph limit)	After (20mph limit)	Percentage point (pp) change
Residential areas	44%	47%	+3pp
City centre areas	59%	65%	+6pp
Residential areas only ^a			
Where before median speeds were <20 mph	78%	80%	+2pp
Where before median speeds were between 20 and 24 mph	37%	42%	+5pp
Where before median speeds were >24 mph	12%	16%	+4pp
Major strategic roads	43%	46%	+3pp
Important local roads	36%	40%	+4pp
Minor local roads	56%	57%	+1pp
Peak periods (07:00-10:00; 16:00-19:00) ^b	48% (24%)	52% (30%)	+4pp (+6pp)
Non-peak periods (All other hours) ^b	42% (24%)	45% (27%)	+3pp (+4pp)

a. A similar breakdown has not been provided for city centre areas due to the smaller sample size.

b. Peak and non-peak figures in brackets exclude roads with a before median speed <20mph, to remove the influence of congestion and isolate the impact of journey time.

Analysis of the characteristics of the spot speed sites with the highest after speeds shows that poor compliance is associated with environments which create a perception of space and openness, and provide the driver with good visibility. This may encourage drivers to adopt higher speeds, because they do not need to slow down to allow vehicles to pass, and perceive there to be less risk of a collision. In contrast, the roads with the highest compliance are all located on 'minor local roads' and have environments which are likely to constrain speeds - because their length provides less opportunity to build-up speed, visibility may be limited, drivers feel that they need to 'squeeze' passed parked vehicles and do not feel that they have sufficient space to drive faster, and possibly because they are either starting or ending their journey and are in less of a hurry at this point.

Table 3. Characteristics of roads with poorest and highest compliance (post implementation)

Characteristics associated with poor compliance	Characteristics associated with high compliance
<ul style="list-style-type: none"> • Open road environment (wide roads, and moderate-high distances from the middle of the road to the adjacent houses), with low levels of on-street parking. • Often contain long sections of straight or slightly curved road. • Typically at least 500m long, allowing drivers to progressively build up speed. • Mainly residential streets. Generally no schools 	<ul style="list-style-type: none"> • All located on 'minor local roads'. • Narrow road environment (in terms of carriageway, road and/or building to building width), with medium to high levels of on-street parking; • Typically straight roads with few junctions, but all are short roads where there is less scope to achieve faster speeds. • Mainly residential streets, located within a

Characteristics associated with poor compliance	Characteristics associated with high compliance
<p>or major trip attractors nearby which might generate high levels of walking and cycling.</p> <ul style="list-style-type: none"> Roads are likely to be used as through routes as well as by local residents. In many cases, they could be used as shortcuts or rat runs, with drivers keen to maintain a higher speed to reach their destination. 	<p>housing estate / area.</p> <ul style="list-style-type: none"> Roads are likely to be used predominantly by local residents leaving or arriving home. Most drivers are likely to be either at the start or the end of their journey.

Compliance is higher in peak than non-peak periods; but if roads with a before median speed of less than 20mph are excluded, to remove the influence of congestion and isolate the impact of journey purpose, then the results show very little difference.

Spot speed data collected in one case study area suggests that 20mph compliance amongst HGV drivers (41%) is lower than for car (46%) and LGV (45%) drivers, with the difference found to be significant. The data was collected as part of the on-going programme to monitor roads where complaints have been received by the public, so overall levels of compliance are expected to be lower than elsewhere. It was not possible to undertake similar analysis for other case study areas.

4.4. How has the profile of speeds changed?

This section looks at how the profile of speeds has changed. Firstly, the actual changes in speed are examined at a case study and site specific level. Regardless of whether this is due to the introduction of the new speed limits, the actual changes are important in influencing subsequent outcomes such as the attractiveness of walking and cycling, perceptions about the environment, journey times, the number and severity of collisions, and environmental impacts. Secondly, the results of the comparator analysis are presented to estimate the extent to which the observed change can be attributed to the introduction of the 20mph limits.

4.4.1. Actual changes in speed in the case study areas

Journey speed analysis shows that the median speed has fallen by 0.7mph in residential areas and 0.9mph in city centre areas. Spot speed analysis shows a reduction in mean vehicle speed in four case study areas (based on both unweighted and flow weighted data²²) varying from -0.9mph to -2.3mph; and in a fifth case study area (-1.5mph) based on flow weighted data only. There was no significant change in three case study areas.

Faster drivers have reduced their speed more, with the 85th percentile speed falling by -1.1mph in residential areas and by -1.6mph in city centre areas, based on journey speed data. This is a key finding, as other research shows that higher speeds are associated with increased safety risk (more collisions, increased severity, perceptions that the environment is not safe for vulnerable users).

The spread of speeds, indicated by the 15th-85th percentile range, has declined by 1.3mph in residential areas, and by 2.0mph in city centre areas, indicating more consistency in the driving speeds on 20mph limit roads.

The overall change in speeds is greater where speeds were faster before (the median speed fell by -1.3mph on residential roads with a before speed of more than 24mph). The reduction in speed was also greater on 'important local roads' (where the median speed dropped by 1.1mph); while on 'minor local roads', which make up the majority of the sample, the median speed was already below 20mph and dropped by just 0.1mph.

The results suggest that road characteristics have a much larger impact on the speeds that drivers choose to adopt than whether the road has a 30mph or 20mph limit. The differences in speed between the different road categories in Figures 5 and 6 (represented by the different coloured curves) are far larger than the

²² Unweighted metrics treat all sites equally, and reflect average speeds across the chosen sites; flow-weighted metrics place more emphasis on higher flow sites and are more representative of the behaviour of all drivers.

changes brought about by lowering the speed limit (represented by the solid and dashed curves for each road category).

Figure 5. New 20mph limits (signed only) – Cumulative speed distribution, by pre-scheme speed (residential areas only), based on GPS journey speed data

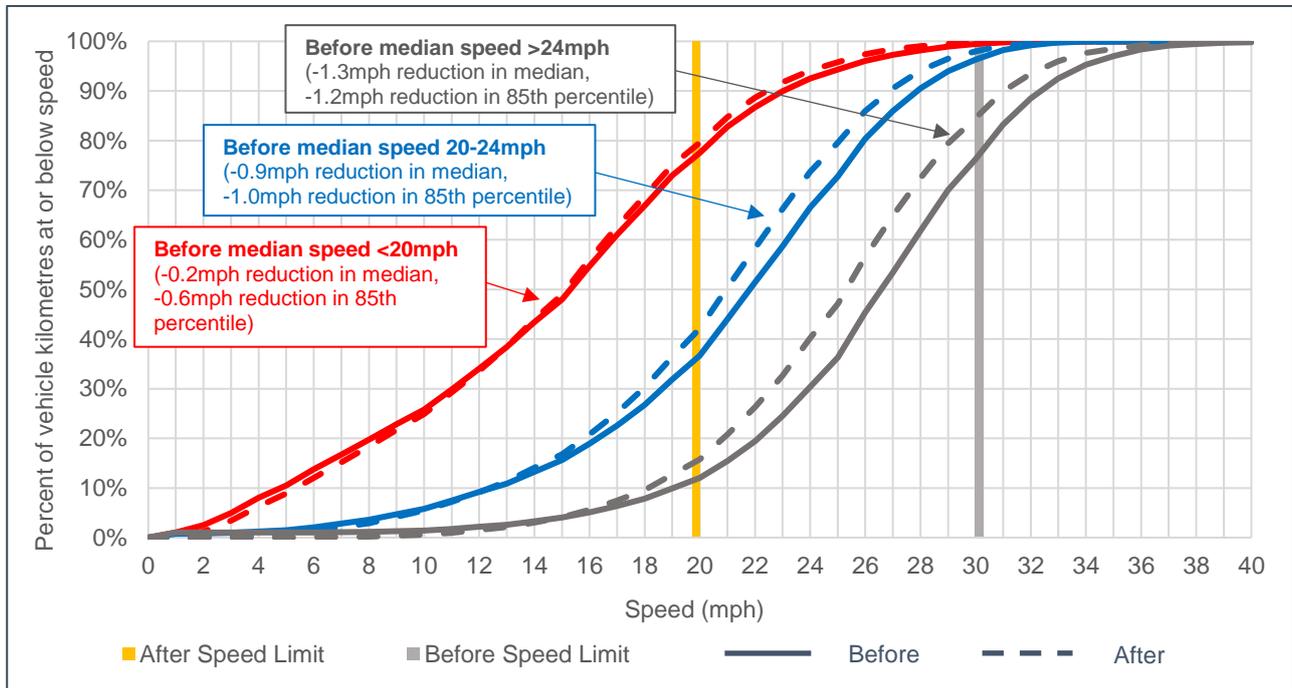
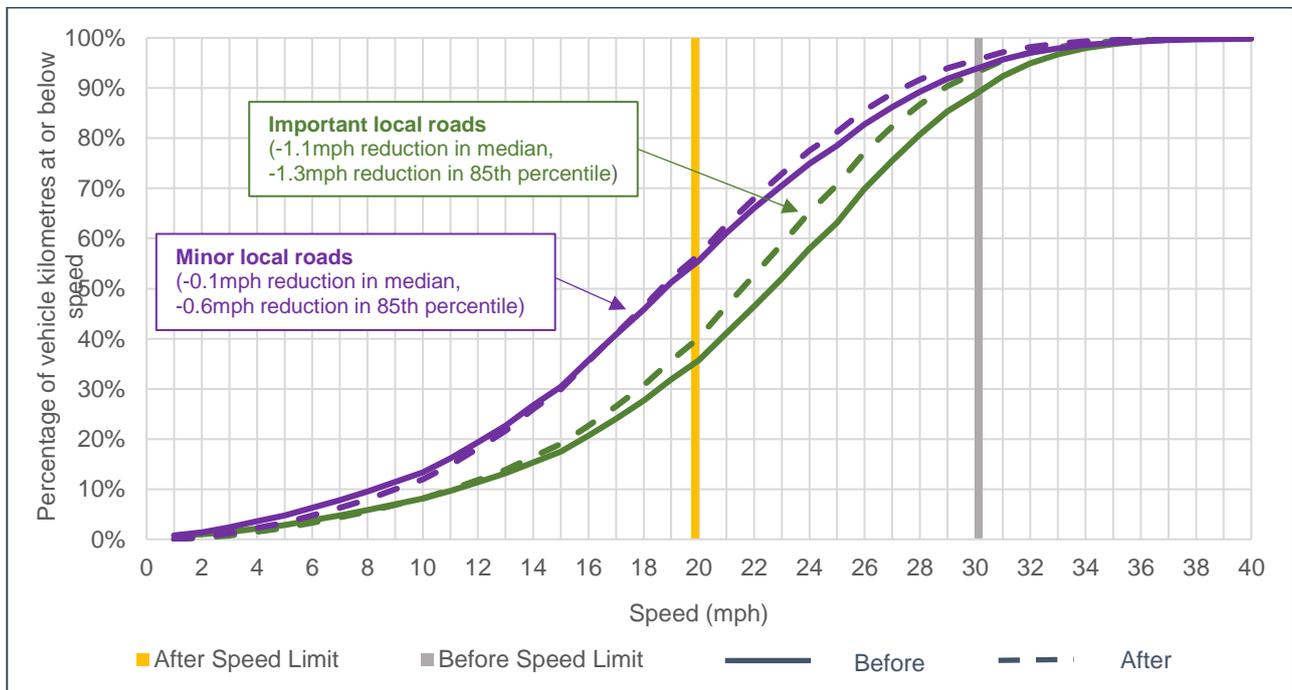


Figure 6. New 20mph limits (signed only) – Cumulative speed distribution, by road type (residential areas only), based on GPS journey speed data



Interpretation of cumulative distribution graphs – The above graphs shows the percentage of driver vehicle kilometres (vkms) travelling at or below a specific speed; with 20mph and 30mph speeds highlighted by vertical lines to show the before and after speed limits.

When the speed limit was 30mph (i.e. during the ‘before’ period, represented by the solid lines), a higher percentage of vehicles travelled at / close to this speed, resulting in the curve of the graphs being skewed to the right. Following implementation of the 20mph limit (i.e. during the ‘after’ period, represented by the dashed lines), a higher percentage of drivers are travelling at lower speeds, moving the distribution curve to the left.

The larger the shift to the left (and the bigger the gap between the before and after period), the higher percentage of drivers now travelling at lower speeds. Similarly, the bigger the gap between the different road categories, the bigger the difference in speed, with the categories on the left showing the slowest speeds.

Bigger changes were recorded at individual spot speed sites, with the change in mean speed varying from -7.2mph (reduction) to +4.3mph (increase); and the change in 85th percentile speeds varying from -9.0mph (decrease) to +7.6mph (increase).

None of the case studies stand out as performing particularly strongly or poorly overall in terms of the average change in speeds across the scheme areas. This is despite the schemes being implemented in a range of different geographical and speed environments.

4.4.2. Comparator analysis (evidence of 20mph limit impact)

To strengthen the evidence relating to changes, data for comparator areas has been used to compare case study trends with background trends on 30mph roads with similar characteristics to the case study areas. This provides a more robust methodology than a simple before and after analysis and interpretation of intervention logic; and provides evidence on the extent to which case study changes may be attributed to the introduction of 20mph limits.

Existing evidence suggests that there has been a small downward trend in speeds in recent years, across a range of road types, based on data collected by the DfT on locally managed A roads and free-flowing 30mph roads:

- Between December 2011 and December 2015, average vehicle speeds on locally managed A roads during the weekday morning peak dropped at a fairly consistent rate by 1.9mph, from 25.4mph to 23.5mph²³.
- In addition, between 2011 and 2016, there was a slight reduction in average free flow speeds for cars – of less than 1mph on 30mph roads (31mph in 2011, 31mph in 2016)²⁴.

It is possible that this trend may have extended to the 20mph limit roads in the case study areas, and that the reduction in speeds reported in the above section may be simply a reflection of background trends and would have occurred even if the 20mph limits had not been introduced. Factors likely to affect background speeds in local areas include a general lowering of speed limits, national speed campaigns (such as the DfT's *Think!* road safety speed campaign), an increase in the number of fixed penalty notices issued for speed limit offences and increasing attendance at speed awareness / retraining courses²⁵, and use of in-car technology (including satellite navigational devices which display the speed limit, cruise control, and speed limiters).

Each case study area has therefore been associated with a 30mph comparator area, used as a control for what would have been likely to occur over time had the 20mph signed only limits not been introduced. This provides context against which to measure the observed speed changes in the case study areas.

As highlighted in Chapter 1, for practical reasons it was only possible to obtain speed data for three comparator areas, each covering a 20km² area. These have been matched to three groupings of case studies, based on geographical region, Rural Urban Classification, and index of multiple deprivation. For context, the case study areas included in the comparator analysis cover a combined area of 110km².

Statistical analysis shows a significant reduction in speeds, relative to comparator areas, for important local roads in residential areas and for an aggregation of all road types in city centre areas:

- The relative change on important local roads in residential areas is estimated at -0.81mph for the median speed, -1.11mph for the 85th percentile speed, and -1.0mph for the 15th-85th percentile range.

²³ Department for Transport (2017a) Average speed on local 'A' roads: monthly and annual averages (Table CGN0501) – updated May 2017. <https://www.gov.uk/government/statistical-data-sets/average-speed-and-delay-on-local-a-roads-cgn05>

²⁴ Department for Transport (2017) Free flow vehicle speeds in Great Britain: 2016 tables <https://www.gov.uk/government/statistics/free-flow-vehicle-speeds-in-great-britain-2015>

²⁵ Between 2011 and 2016 the number of fixed penalty notices issued nationally for speed limit offences (across all speed limits) increased by 30%, and the proportion attending driver awareness / retraining courses increased from 14% to 46% (Police powers and procedures, England and Wales, year ending 31 March 2017, Home Office).

- The relative change across all roads in city centre area, is estimated at -0.57mph for the median speed, -0.99mph for the 85th percentile speed, and -1.27mph for the 15th-85th percentile range.

The findings suggest that the absolute changes in speed observed in the case study areas are partly due to the implementation of 20mph limits (particularly on important local roads in residential areas), but also reflect background trends in speed on urban roads. The comparator areas all show a reduction in speeds over the period of analysis (varying from -0.1 to -1.0mph); broadly consistent with wider DfT evidence described above.

Wider evidence on speed change in 20mph limits (UK experience)

The reductions in average speed presented here are similar to those observed in other studies, including early evaluations of schemes in Scotland (Burns, A et al., 2001), Portsmouth (Atkins, 2010), Bristol pilot areas (Bristol City Council, 2012), and Edinburgh pilot area (Edinburgh City Council, 2013), which reported reductions in average speed of 0.5-2mph based on spot speed data.

They also reflect a more recent evaluation of the Bristol scheme (Pilkington et al. 2018) which reported a 0.8mph reduction in journey-based speeds (but with no comparison against background trends), and a statistically significant 2.7mph decrease in vehicle speeds, after controlling for time of day, day of week, season, year, type of road, etc. The study also observed that the highest reduction in speed was on 20mph A and B roads. In the areas that kept a 30mph limit, there was a very small but significant reduction in speed (0.04 mph).

The change in speed observed is broadly consistent with the findings of Finch et al. (1994) which found that a change in the speed limit results in a change in the average traffic speed which is roughly one-quarter of the value of the change in the limit.

4.5. How has effectiveness changed over time?

Limited data was available regarding the effectiveness of 20mph limits over time. While the findings can't be generalised to other areas, the findings do not support the hypothesis that speeds might increase over time:

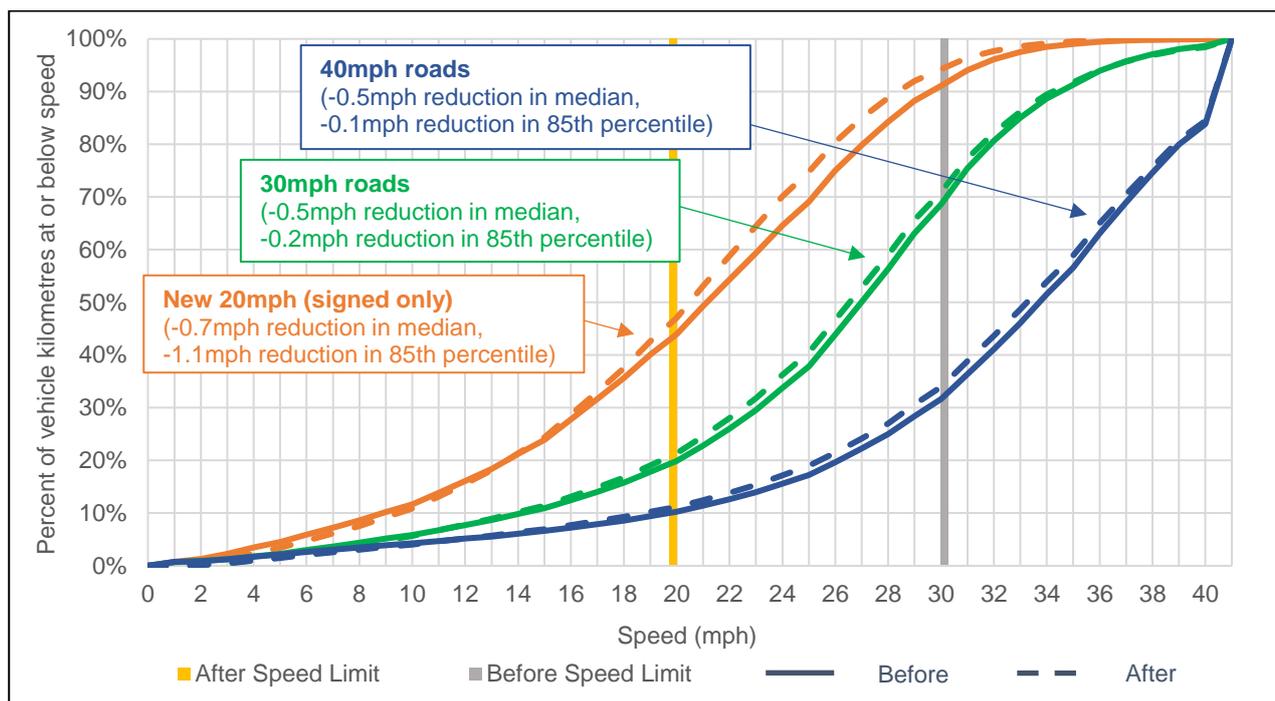
- The city-wide 20mph limit in Portsmouth was implemented substantially earlier than other case study schemes, enabling long term analysis to be undertaken, comparing outcomes one year and seven years' post implementation. Evidence from journey speed analysis shows an increase in 20mph compliance over time, from 58% one year after (2009) to 62% seven years after (2015); a reduction in the median speed (from 18.4mph to 17.9mph); and a reduction in the 85th percentile (from 25.8mph to 24.8mph). It has not been possible to fully account for background trends in speed, as comparator data was not obtained for this timespan.
- Data for Brighton Phase 2 (residential) and Phase 1 (city centre focused) was collected one year and two years post implementation. In both cases, there is no evidence to suggest a significant change in mean or 85th percentile speeds between the two after periods.

4.6. How have speeds on neighbouring roads changed?

Almost half of non-resident drivers (44%) said that they were more likely to drive above the speed limit when leaving the 20mph area – due to the frustration associated with driving slowly or to make up time. However, journey speed analysis shows a small decline in speeds on surrounding 30mph and 40mph roads (-0.5mph for both categories) across the case study areas (Figure 7); suggesting that this is not happening on a regular basis.

The observed reduction in median speeds on neighbouring 30mph and 40mph roads could suggest that drivers are getting used to travelling at slower speeds and are carrying this behaviour from the 20mph roads onto surrounding roads. Alternatively, it could be due to a general downward trend in speeds. The comparator areas all show a reduction in speeds over the period of analysis; and evidence collected by DfT suggests that there has been a small downward trend in speeds on local urban roads in recent years.

Figure 7. Cumulative speed distribution for new 20mph roads, and nearby 30mph and 40mph roads (residential areas only), based on GPS journey speed data



For all categories of road, the 'after' (dotted) curve is to the left of the 'before' curve, indicating a lowering of speeds.

4.7. Have residents and drivers noticed a change in speed?

The majority of resident (about two-thirds) and non-resident drivers (just over half) have not noticed a reduction in the speed of vehicles, and do not perceive there to be fewer vehicles driving at excessive speeds for the area. This is not surprising as the actual reduction in speeds has been small.

4.8. What do drivers say about their own driving behaviour?

Compliance – Approximately four fifths of drivers (residents 78%, and non-residents 83%) participating in the surveys stated that they complied with the 20mph limit most of the time. This is higher than indicated by the journey speed and spot speed data. This may be because respondents are unaware of their true speed or are reluctant to admit to speeding in their local area.

Change in driving speed – Some 69% of resident drivers and 74% of non-resident drivers stated that they now drive at a slower speed than previously.

Consistency of driving speed – It has not been possible to collect evidence to assess whether 20mph limits have resulted in smoother, more consistent driving at an individual driver level (with less acceleration and deceleration).

Propensity to speed on different types of roads – Around half of resident drivers and non-resident drivers acknowledged a tendency to speed. Propensity to speed tends to be broadly similar on 20mph limit roads, 30mph and motorway roads (e.g. 35%, 37%, 41% of non-resident drivers). However, some drivers felt that they were less likely to speed on 20mph roads with traffic calming (23% of non-resident drivers).

4.9. Do 20mph limits make slower speeds more acceptable?

Most resident drivers (72%) and non-resident drivers (69%) agreed that “the 20mph limit makes it more acceptable to drive at a lower speed”.

4.10. How has driver awareness and assessment of risk changed?

A net proportion (% agree - % disagree) of non-resident drivers (+44%)²⁶ and resident drivers (+7%)²⁷ agreed that 20mph limits increase driver awareness of potential risks and hazards.

Feedback from driver interviews suggests that a minority are likely to pay less attention, because they are focusing on their speed, distracted by in-car devices, or frustrated with driving slowly.

Most drivers interviewed report that they are more conscious of their driving environment and are therefore likely to be better able to respond to hazards.

²⁶ 64% agreed, 20% disagreed.

²⁷ 44% agreed, 37% disagreed.

5. What factors influence speed compliance?

5.1. Introduction

The previous chapter shows that 53% of drivers in residential areas and 35% in city centre areas are exceeding the 20mph limit (based on journey speed analysis); although only 30% and 15% respectively are driving faster than 24mph²⁸.

This chapter examines the factors associated with compliance and non-compliance; the role of enforcement in encouraging compliance; and what would make drivers comply more.

For context, DfT Circular 01/2013 (Setting Local Speed Limits) states that “*speed limits should be evidenced and self-explaining and seek to reinforce people’s assessment of what is a safe speed to travel. They should encourage self-compliance.*” With specific reference to 20mph limits, it states that “*there should be no expectation on the police to provide additional enforcement beyond their routine activity, unless this has been explicitly agreed*”.

Furthermore, police guidelines²⁹ indicate that enforcement should be reactive rather than proactive, and targeted where there is deliberate offending / disregarding, and the limits are clear (see Section 1.6).

5.2. What factors are associated with compliance?

Non-resident drivers participating in the in-depth interviews were asked why they or others did or didn’t abide by the 20mph limit. Focus group participants were asked about enforcement, the consequences of exceeding 20mph, and driving behaviour in different circumstances. The most frequently mentioned themes were:

- road environment (drivers adapt to the conditions and nature of the road, and some roads encourage slower speeds because they have characteristics which make it difficult or unsafe to travel faster, due to their geometry, presence of parked vehicles, or higher traffic flows);
- presence of vulnerable users (e.g. near a school or hospital) or around areas of high pedestrian activity;
- discussion within the community about road safety; and
- drivers with children (who may be more likely to recognise the benefits).

In addition, young drivers commented that they pay more attention to the limit when driving locally, due to the high profile of the scheme within the local community and because the importance of complying with the 20mph limit had been instilled in them when learning to drive in the local area. However, this behaviour is not necessarily applied when driving elsewhere (where they are less aware / conscious of the limit) or on roads with higher speed limits.

5.3. What factors are associated with non-compliance?

Drivers and focus group participants identified **lack of enforcement** and lack of concern about the consequences of speeding as the primary reason for non-compliance. Drivers typically want to reach their destination quickly and want to drive faster than 20mph for various reasons (see below). Lack of visible enforcement activity, most of the time, means that there is little to deter them from doing so.

Other common themes identified in the focus groups and driver interviews include the following:

- time pressures and pace of life (drivers are in a hurry and want to get to their destinations quickly);
- frustration (20mph seems very slow);

²⁸ This is the recommended threshold for fixed penalty notices or speed awareness courses in the ACPO Speed Enforcement Policy Guidelines 2011-2015. In addition, Circular 01/2013 suggests that where average speeds exceed 24mph the introduction of signage only is unlikely to lead to 20mph compliance.

²⁹ Speed Enforcement Policy Guidelines 2011-2015: Joining Forces for Safer Roads (ACPO).

- speed limit perceived unnecessary or inappropriate (drivers feel that they are able to drive safely at higher speeds, or instinctively adapt their driving speed to the conditions and nature of the road – see next bullet);
- road environment and time of day (higher speeds are more likely on roads which are wide, straight, without parked cars, and with less traffic to hinder or enforce slower speeds);
- influence or pressure from other drivers;

and to a lesser extent:

- 20mph is an uncomfortable speed; and lack of awareness of limit.

In addition, lack of awareness of own driving speed may be a factor; along with incorrect information about speed limits on satellite navigation devices.

5.4. What is the role of enforcement in encouraging compliance?

There was considerable discussion about the topic of enforcement within the focus group and driver interviews.

Level of enforcement – Evidence provided by the case study authorities (interviews with police and local authority officers) suggests that, most of the time, the level of enforcement³⁰ has been low across the case study areas; broadly reflecting the guidance set out in DfT Circular 01/2013 and ACPO Speed Enforcement Policy Guidelines 2011-2015. Community-based initiatives (e.g. community speed watch, and education interventions for offenders), and vehicle activated signs have been implemented in a few locations, but have been sporadic and involved a small number of interventions only. This is likely to have contributed to the small change in average speed observed across all of the case studies, and the absence of any particularly strong performers in terms of speed reduction. One example of a more proactive approach to police enforcement is Operation Hawmill in Calderdale which resulted in 34 tickets being issued for speeding on 20mph limit roads over a 6 month period.

Should 20mph limits be enforced more? – While lack of enforcement appears to be a key reason for non-compliance, the public had mixed views on whether levels of enforcement activity on 20mph roads should be increased in practice. Reasons for not enforcing the limits more included the likely cost, other competing pressures on police resources, and because those who do exceed the limit aren't doing so excessively. Views were mixed on the relative focus which should be placed on enforcement of 20mph limits compared with other limits (30mph-70mph).

Effectiveness of vehicle activated signs – Evidence from two case studies suggest that vehicle activated signs can achieve substantial reductions for short periods, but locations need to be re-visited to maintain benefits.

5.5. What would make drivers comply more?

Main suggestions – Drivers and focus group participants highlighted the pros and cons regarding the various enforcement options available (police presence, speed cameras and average speed cameras, vehicle activated signs, awareness campaigns, awareness courses, social media, initiatives to name and shame offenders).

It is worth noting that the results of a recent evaluation of the National Speed Awareness Course (NSAC)³¹ indicated that participation in the course was more effective at reducing speed reoffending than a Fixed Penalty Notice (comprising a fine and penalty points) over a period of 3 years following the initial offer to attend. This result was obtained using a variety of analytical approaches giving greater confidence that differences in reoffending rates are due to participation in the course rather than other factors (such as differences in the attitudes or characteristics of those who do and do not take the course).

³⁰ Police guidelines indicate that enforcement should be reactive rather than proactive, and targeted where there is deliberate offending / disregarding, and the limits are clear (see Section 1.6).

³¹ Ipsos MORI, et. al., (2018); Impact Evaluation of the National Speed Awareness Course.

Role of traffic calming – There was moderate support for introducing traffic calming measures to encourage compliance (with 44% of resident drivers and 38% of non-resident drivers agreeing).

6. What are the perceptions about walking and cycling in 20mph limits?

6.1. Introduction

This chapter examines whether the introduction of 20mph limits (signed only) improves perceptions about the attractiveness of the local area for walking and cycling. Changes in perception about walking and cycling are assumed to be driven by:

- the lowering of the speed limit and the designation of the area as a 20mph limit;
- a perceived reduction in the average vehicle speed and in the fastest speeds;
- a perceived increase in driver awareness of risks and hazards, and greater consideration towards pedestrians and cyclists; and
- a perception that the area is now safer with fewer collisions, casualties and near misses.

Existing research shows how fear of collisions may suppress travel by modes such as walking and cycling; and that improving driver behaviour has the potential to encourage active travel.

- Noland (1995) identifies risk, and its perception, as an important factor in people shifting to walking and especially cycling. The research shows that perceived safety improvements in cycle infrastructure have an aggregate elasticity value that is greater than one. This means that cycle safety improvements attract proportionately more people to commute by cycle (i.e. a 10% increase in safety results in a greater than 10% increase in the share of people cycling to work).
- Watkiss et al. (2000) notes that fear of traffic accidents amongst groups such as cyclists and children may reduce willingness to use these modes. However, they also highlighted that there was currently a lack of research available to quantify any such effect.
- Sanders (2013) shows that 'near miss' incidents are a key factor shaping cyclists' perceptions of risk and likelihood to cycle.

It is worth re-iterating that the majority of resident (about two-thirds) and non-resident drivers (just over half) surveyed for this study have not noticed a reduction in the speed of vehicles, and do not perceive there to be fewer vehicles driving at excessive speeds for the area.

6.2. What do residents, drivers, and existing cyclists think?

Overall, 20mph limits are perceived to be beneficial for cyclists and pedestrians:

- 69% of residents agreed that the 20mph limits are beneficial for cyclists and pedestrians;
- 74% of non-resident drivers agreed that the 20mph limits are beneficial for cyclists, and 77% agreed they are beneficial for pedestrians; and
- 69% of existing cyclists (nationwide) agreed that 20mph limits are beneficial for cyclists, and 89% agreed they are beneficial for pedestrians.

Residents in the larger area-wide residential case study areas (72%) are more positive than those in the city centre areas (61%).

Focus group discussions suggest that these views are driven by perceptions about the potential safety benefits of slower vehicle speeds, rather than because drivers have been seen to be more considerate to pedestrians and cyclists.

Views of residents – Amongst the case study residents:

- 51% agreed that the introduction of the 20mph limit provides a more pleasant environment for walking and cycling (24% disagreed); and,
- 60% felt that the limit provides a safer environment for walking and cycling (21% disagreed).

Slightly more residents³² agreed (42%), than disagreed (37%), that the 20mph limits increase drivers' awareness of potential risks and hazards (e.g. cyclists, children playing, etc.). However:

- only 21% of residents agreed that drivers are more considerate to pedestrians; and
- only 17% of residents agreed that drivers are more considerate to cyclists.

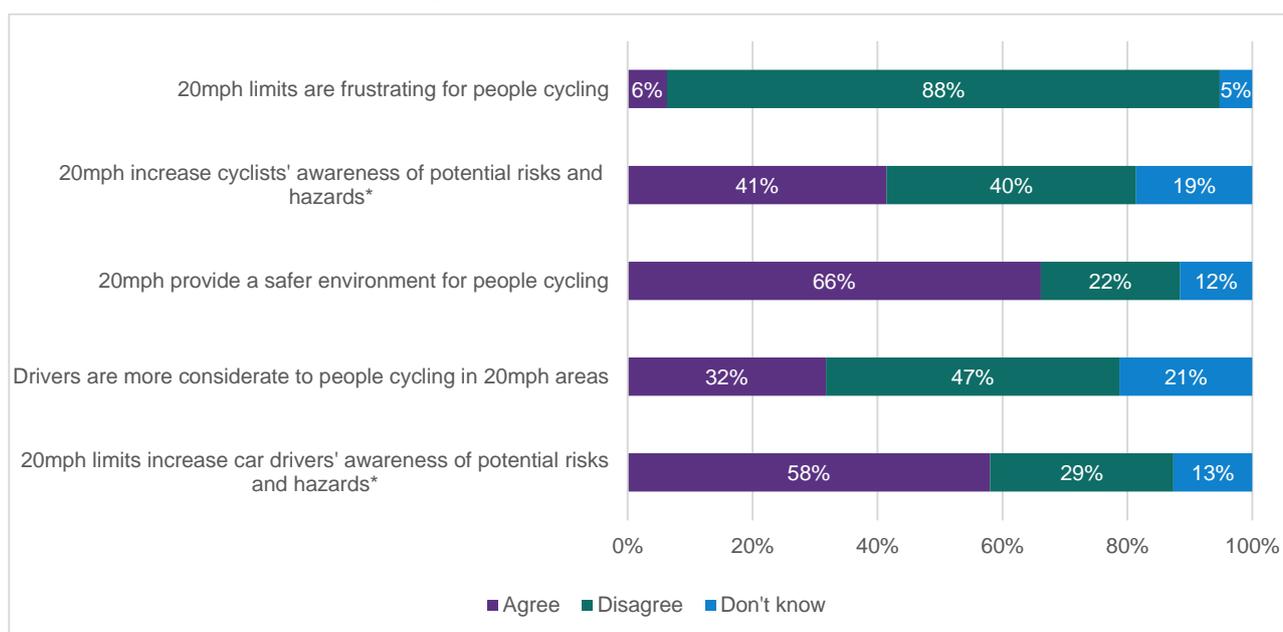
In addition, child safety remains a concern, and only 28% of residents agreed that the street now provides a safer environment for children.

Views of non-resident drivers – The proportion of non-resident drivers perceiving 20mph limits to be beneficial to cyclists and pedestrians is also high; suggesting that they are aware of the impact that their driving style and speed has on the propensity for walking and cycling.

Views of parents with children aged 7-10 years – Focus group participants reported that the introduction of the 20mph limit had little impact on whether they would allow their children to walk or cycle to schools or other destinations. Many felt that their children were too young to travel independently and were concerned about the risks associated with crime, anti-social behaviour and personal security, as well as vehicle speeds.

Views of cyclists (nationwide) – Evidence from the nationwide cyclist survey shows that the majority of cyclists (69%) felt that 20mph limits are beneficial for cyclists, with only 4% describing them as detrimental. In addition, 66% agreed that the limits create a safer environment for cycling; however, only 32% felt that drivers are more considerate to people cycling in 20mph areas, with 47% disagreeing.

Figure 8. Perceptions of existing cyclists about the impact of 20mph limits on the quality of the walking and cycling environment



*Nationwide online cyclists survey (vis Sustrans).
n (sample size): 1,419 to 1,427 (number of responses varied slightly between statements).*

6.3. How important are 20mph limits in terms of the perceived quality of the walking environment?

Views of residents – Focus group participants reported that slower speeds are important in terms of creating a safe and attractive environment for walking. However, respondents did not perceive any substantial change in speed, and speed is only one of a combination of factors required to improve the environment for walking. Quiet streets, wide pavements, safe crossing points, and feeling safe and secure

³² Including drivers and non-drivers. There was no significant difference between the results for the two sub-categories.

were also important factors. So, whilst speed is important, slower speeds on their own aren't generally enough to change perceptions and behaviour - but are a move in the right direction.

In the case study areas, there continues to be a range of barriers which discourage walking; and for many drivers, time constraints, journey distance, and a general preference for driving are also important considerations.

6.4. How important are 20mph limits in terms of the perceived quality of the cycling environment?

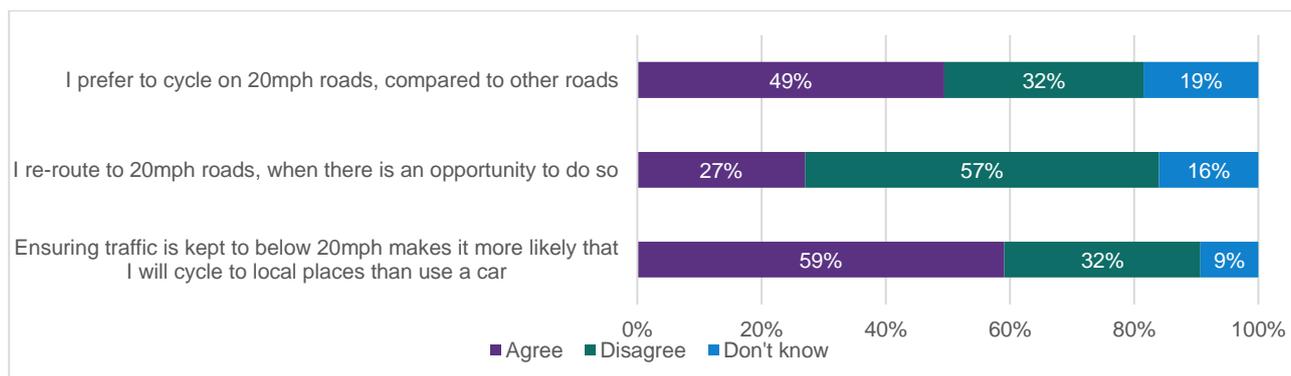
Views of residents – As with walking, slower speeds is just one of the factors needed to encourage cycling. Quieter streets (with less traffic), appropriate cycle infrastructure (segregated and unsegregated cycle lanes, safe crossings, sufficient space, cycle parking) which makes cyclists feel safe and secure, and considerate behaviour from drivers and other cyclists are all important requirements for a safe and attractive cycling environment, alongside slower speeds.

Views of cyclists (nationwide) – Many of the benefits identified by respondents to the online survey relate to the reduced speed differential between cars and cycles, as well as slower vehicle speeds. These factors are perceived to create a safer environment in general and reduce the severity of injuries, reduce the risk from overtaking, give cyclists more time to manoeuvre, put cyclists under less pressure, and reduce the likelihood of drivers getting frustrated with cyclists. 20mph limits are also perceived to increase driver awareness and observance regarding cyclists, and give both parties more reaction time.

A small minority raised concerns about the lack of compliance which is perceived as reducing or making the intervention ineffective; an increase in driver frustration and associated behaviour; an increase in the likelihood of conflict or fear of a collision, particularly when overtaking; and the potential for creating false expectations about the quality of the cycling environment. A few respondents commented that 20mph limits are often implemented in environments where there is little space for cars and cyclists, so the risk to cyclists is high regardless of the speed limit.

Around half of respondents (49%) prefer to cycle on 20mph roads. These are mainly regular cyclists and the proportion may be higher amongst less regular and less confident cyclists. However, only a quarter (27%) re-route to use 20mph roads, suggesting that convenience outweighs preference for 20mph roads. The specific conditions associated with the alternative routes (speed, traffic volume, distance) also appear to be important.

Figure 9. Self-reported impact of 20mph limits on cycling behaviour



Nationwide online cyclists survey (via Sustrans).

n (sample size): 1,411 to 1,420 (number of responses varied slightly between statements)

7. How have collision and casualty rates changed?

7.1. Introduction

This chapter examines the impact of new 20mph limits (signed only) on collisions and casualties:

Collision – A ‘personal injury collision’ (referred to here as a ‘collision’) is an incident involving personal injury, which occurs on the public highway (including footways), in which at least one road vehicle is involved and which becomes known to the Police within 30 days of its occurrence.

Casualty – For each personal injury collision, there will be one or more casualty(ies), i.e. the person(s) injured in the collision. This can be the driver or passenger(s) in a vehicle, or be vulnerable road users such as cyclists, pedestrians and equestrians.

Casualties are categorised by severity as fatal, serious injury, and slight injury.

A reduction in collisions and casualties, including vulnerable road users, is expected to occur as a result of:

- a reduction in average speed and top percentile (fastest) speeds;
- smoother, more consistent driving speeds;
- an increase in driver awareness.

Geographically coded police data on road casualties, referred to as STATS19 data, was used to examine the number and type of collisions and casualties.

Comparator areas have been identified for each case study, to control for background trends in collisions related to factors such as technology improvements, environment, road type, weather, economic trends, traffic growth, etc. All comparator areas comprise urban 30mph roads in locations with similar geographical characteristics (in terms of urban density and form) to the case study areas. The purpose of the comparator areas is to estimate what would have happened in the case study locations (in terms of change in collisions and casualties), if the 20mph limit schemes had not been implemented. The case study areas are assumed to be affected by the same background trends as the identified comparator areas. The difference between the actual change in collisions in the case study areas, and the estimated background trend, can then be assumed to represent the effect of the 20mph limit (described as the intervention effect).

In order to estimate the ‘intervention effect’, a generalised linear model³³ has been used. This uses the 30mph comparator areas to adjust for background trends in the collision / casualty data available for each case study. A key strength of the approach, is the ability to make use of all data available for each case study however limited or extensive. The ‘before’ data covers 5 years and leaves a gap of one year prior to implementation of the 20 mph limits in the case study areas to avoid any changes in behaviour in the run up to implementation. The ‘after’ data covers between 17 and 44 months, depending on the case study in question. No post implementation gap has been left in order to maximise the amount of data available.

To understand more about the nature of collisions in 20mph limit areas, DfT’s Contributory Factors Database was interrogated. This provides a subjective coding of factors which may have contributed to collisions. The contributory factors are for information purposes only and not intended to assign blame. Only collisions where the police attended the scene and reported at least one contributory factor are included in the database. Police officers do not need to carry out a full investigation of the incident before allocating contributory factors. They usually use professional judgement about what they can see at the scene. Some contributory factors, such as exceeding the speed limit, may not be obvious to the officer and are, therefore, likely to be under-reported. Given these caveats, and the small number of collisions involved, the contributory factors findings should be treated as indicative only.

³³ A generalised linear model is a version of an ordinary linear regression model that allows for response variables that have error distribution models other than a normal distribution.

Existing evidence on factors affecting collision and casualty rates – There is an established positive relationship between vehicle speed and collisions³⁴ – the higher the speed, the more collisions and where collisions do occur, the higher the risk of a fatal injury at higher speeds. The spread of speeds and proportion of vehicles driving above the speed limit are also important.

Other factors affecting collisions and the severity of casualties include traffic volume, road type, land use and area type, user type, and socio-demographic characteristics. These influences have been considered in the selection of comparator areas.

In addition, the DfT has published data to show that the number of collisions per year is reducing, due to improved vehicle technology and other factors. The background trend is therefore an important consideration in any statistical analysis undertaken.

Change expected in case study areas – Evidence presented in Chapter 4 shows that there has been a small reduction in average speed in the case study areas, the speed driven by the fastest drivers (when collision likelihood and severity is highest), and the range of speeds. The results of the comparator analysis indicate that the changes are partly due to the implementation of 20mph limits but also reflect the general downward trend in speeds on urban roads. Nevertheless, theory suggests that the small reduction in actual speeds is likely to have had a positive influence on reducing the number of collisions and casualties in the case study areas. Finch et al. (1994) and Taylor et al. (2000) show that a change in mean spot speed of 1mph can be expected to reduce injury collisions by 5-6%. It is reasonable to expect a change of this order in the case study areas as a result of both the 20mph limits and the background trend. However, the change associated with just the 20mph limits is expected to be substantially less.

Collision numbers are also influenced by flow and road standard³⁵, and substantial changes in traffic flow can be expected to impact on any relationship between speed reduction and collision rates. The data available is limited, but suggests that background traffic flow has increased in the residential case study areas, and has either increased or remained broadly stable on case study 20mph roads. In general, traffic flow is, therefore, expected to have had a neutral or dampening effect on any relationship between speed reduction and collision rates. The picture is more complex in the city centre case studies, as discussed later in this chapter.

Characteristics of 'before' collisions – During the five year 'before' period, the majority of injuries were slight (87%); two fifths of those injured were pedestrians (24%) or cyclists (17%); and a fifth (18%) involved children or older persons. Higher classification roads (with higher traffic flows) had much higher collision rates per road kilometre than lower classification roads: 7.92 on 'important strategic roads', 2.35 on 'important local roads', and 0.30 on 'minor local roads'. The majority of road length in case study areas is in the 'minor local road category', representing over 90% of road length in most case study areas. The exceptions are the two city centre case studies (Brighton Phase 1 and Winchester City Centre) where the proportion of 'important strategic roads' and 'important local roads' is 26% and 40% respectively.

The most common contributory factors (taking into account the data limitations outlined above) were all related to the failure to observe what is happening on the road network: Driver failed to look properly (37%), Pedestrian failed to look properly (17%), Failed to judge other person's speed (15%).

7.2. How have collision and casualty rates changed in case study areas?

7.2.1. Residential case study areas

Relative change - The comparator analysis indicates that there is insufficient evidence to conclude that there has been a significant change in collisions and casualties following the introduction of 20mph limits in residential areas, in the short term (based on the post implementation data available to date).

³⁴ See Taylor et al. (2000), Finch et al. (2004), Elvik (2009), Richards (2010), Kröyer et al. (2014).

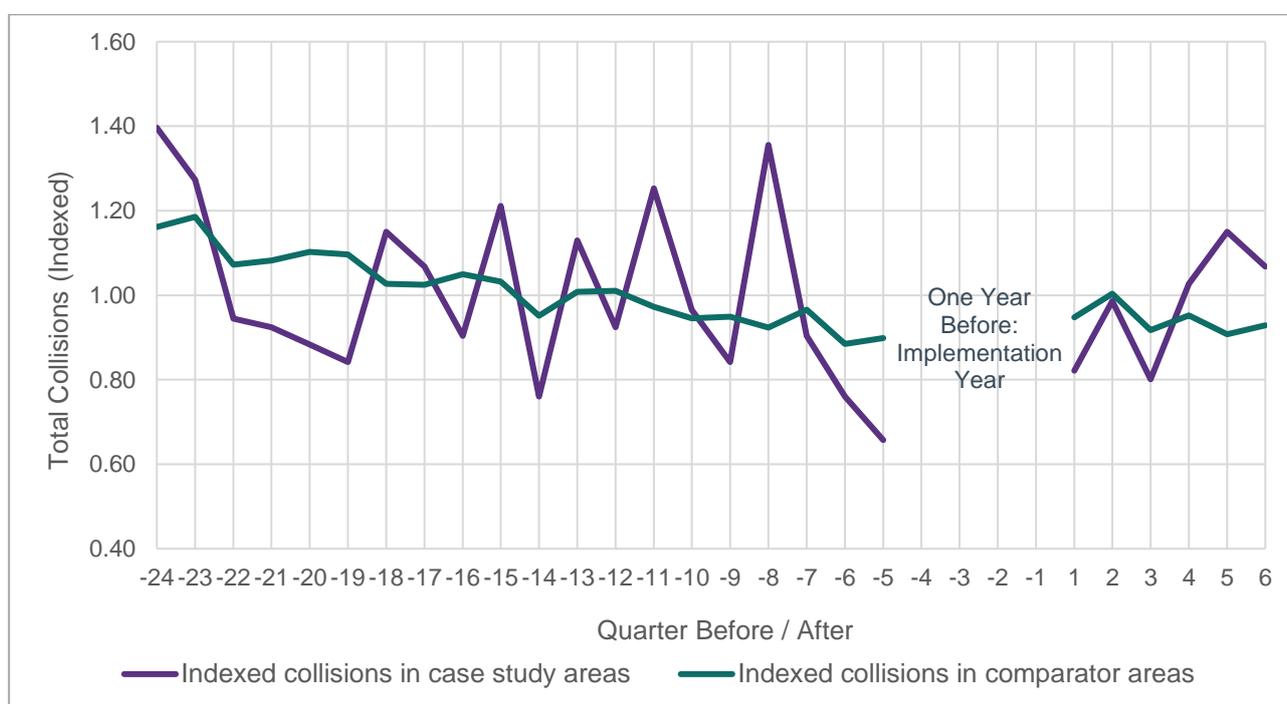
³⁵ As reported earlier, higher classification roads (with higher flow) have much higher collision rates per kilometre than lower road classifications: 7.92 on important strategic roads (FRC1-3), 2.35 on important local roads (FRC4-5), and 0.30 on minor local roads (FRC6-7), based on before data.

Although the absolute number of collisions, casualties, pedestrian casualties, and child casualties (per km, per year) has reduced in the residential areas, there has also been a reduction in the corresponding 30mph comparator areas (Figure 10). The analysis indicates a high level of probability (generally more than 50%) that the relative reductions identified in the case study areas are due to chance, and that there is no meaningful difference between the reduction in the case study and comparator areas³⁶.

It has not been possible to draw any conclusions regarding the relative change in fatal injuries, cycle casualties, and older casualties. Further data is needed to enable a conclusion to be drawn about the scale and direction of change for these categories.

Collision and casualty rates are known to fluctuate from year to year. Some of the analysis is based on small subsets of the data (particularly for collisions involving pedestrians, cyclists, children and older persons), and the post implementation data currently available may not be indicative of the longer term trend. Repeating the analysis in a couple of years' time, when more case study data is available may (or may not) show a significant change.

Figure 10. Quarterly indexed collisions for case study and comparator areas – Predominantly residential case study areas



The data is presented on a quarterly basis over the period that all case study areas have in common. This means that there is quarterly data for 6 years before to 1 year before the scheme (spanning five years in total), and from the first quarter after implementation until quarter six after implementation. While some case study areas have more than six post-scheme quarters of data available, others do not and so this period is shown for consistency across all case study areas. The data is indexed to the average value of each dataset to allow the trend to be observed without the comparison being obscured by the fact that the volume of collisions in comparator areas is much higher than in the case study areas.

7.2.2. City centre case study areas

Relative change – Winchester City Centre and Brighton Phase 1 schemes are both categorised as ‘city centre and adjacent residential area’ schemes. Both case study areas contain a higher proportion of major strategic roads and important local roads than the residential case studies; and hence have much higher collision rates per kilometre.

Brighton Phase 1 is the only case study area where we have been able to estimate a statistically significant change in collisions and casualties, relative to the 30mph comparator area. The results show a significant reduction in overall collisions (-18%), overall casualties (-19%), pedestrian casualties (-29%), and casualties

³⁶ See Technical Report for statistical analysis results, including the estimated change, the confidence interval within which the true change is believed to fall, and the p-value indicating the strength of significance of the result.

aged 75 or over (-51%). However, there is no evidence to indicate a real change in casualties involving cyclists and under 16s, at this time.

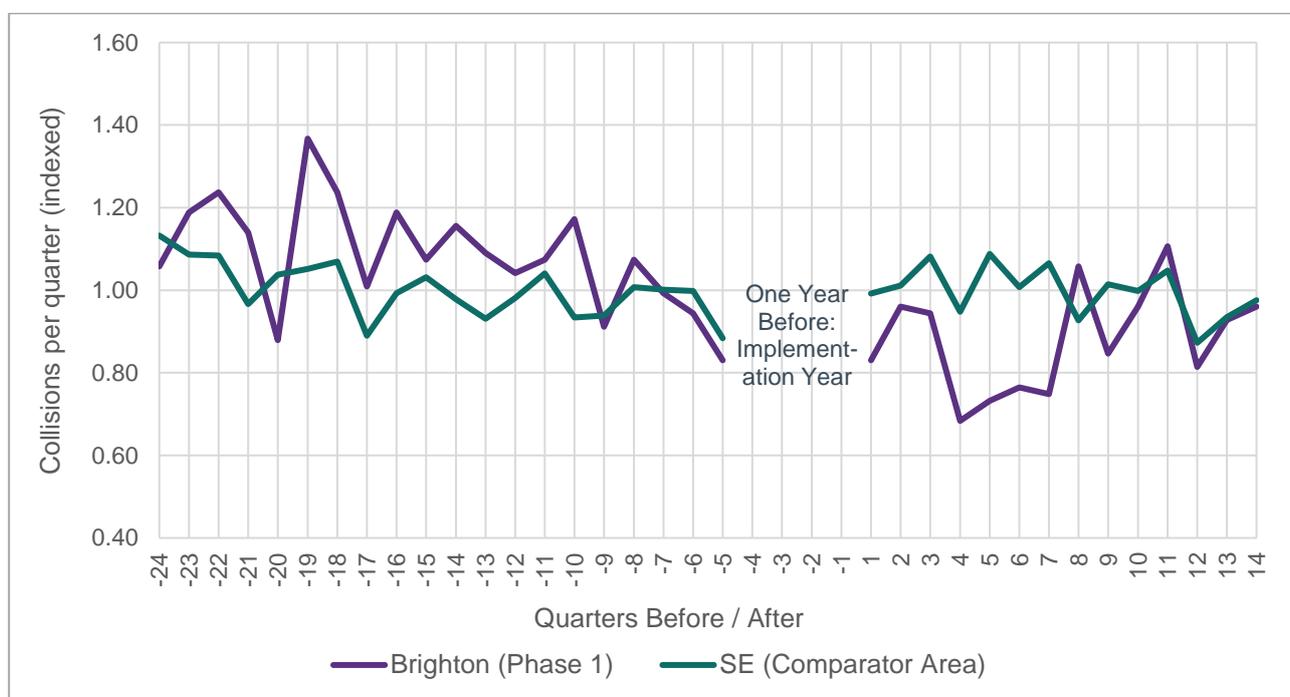
Winchester City Centre is a much smaller area and the results show no significant change in collisions or casualties, at this time. This is likely to be due to the limited number of collisions and casualties in the dataset. The findings described below therefore focus on Brighton Phase 1.

Relevance of comparator trend – To understand what is driving these findings, Figure 11 shows the collision trend in Brighton over time against the trend in the comparator area (other Urban City and Town locations in the South East).

The graph shows that the statistical results are a product of a general downward trend in collisions in Brighton (Phase 1) and a more stable trend in the comparator area.

It is interesting to note that the case study area collisions already appeared to be on a downward trend even prior to the introduction of the 20mph speed limits³⁷, suggesting other factors have influenced the trend. The number of collisions dropped further during the second year following implementation (quarters 4 to 7), but then increased. Further data would be required to determine the long term trend.

Figure 11. Quarterly indexed collisions for Brighton Phase 1 case study and comparator area



The data is indexed to the average value of each dataset to allow the trend to be observed without the comparison being obscured by the fact that the volume of collisions in comparator areas is much higher than in the case study areas.

7.2.3. Role of influencing factors (in Brighton Phase 1)

The above section shows that there has been a significant reduction in overall collisions, overall casualties, pedestrian casualties, and casualties aged 75 or over. To understand what is driving these changes, this section examines the role of influencing factors, including:

- road type;
- intermediate outcomes including change in speed, smoother and more consistent driving, and driver awareness of risks and hazards; and
- external factors such as change in traffic flow, wider policy, the presence of major road works, and reporting processes.

³⁷ The potential reasons for this were discussed with Brighton City Council, but no clear factors were identified.

Change by road type – The changes also appear to be a reflection of the city characteristics; and the blanket implementation of 20mph limits across all roads within the scheme area, including higher flow A and B roads which have typically been excluded from the residential case study schemes.

Analysis by road type shows that there has been a significant reduction in collisions across all road types, but the change has been most pronounced on major strategic roads (-23.7%). These roads have higher flows and much higher per km collision rates than less strategic routes, and the change on these roads contributes substantially to the overall change reported for Brighton Phase 1. Although not as marked, the reduction in collisions on lower order roads in Brighton Phase 1 is also significant (-16.1% on important local roads, and -15% on minor local roads). This contrasts to the experience in other case study areas, comprised predominantly of minor local roads, where there has been no significant change.

Brighton Phase 1 includes the area surrounding the city centre. It is likely that many of the roads categorised as 'important local roads' and 'minor local roads' have higher traffic flows and hence collision rates than similar grade roads in more residential areas. Although many of the minor roads are residential in nature, their proximity to the city centre makes them key distributor roads (which often include shops, services, and offices), and means that they are likely to be used by through traffic as well as local residents. The potential for conflict is likely to be higher than on minor roads in more residential areas, and the potential for a reduction in collisions therefore more likely. This theory is supported by data on collisions per km by case study area, which shows that on all road types, collision rates are higher in Brighton Phase 1 than in the other case study areas.

Change in speed – In the core city centre and in the adjacent residential area, the median speed fell by 0.8mph and 1.0mph respectively, the 85th percentile speed by 1.5mph and 1.5mph (representing a reduction in the fastest speeds), and the 15th-85th percentile speed by 1.6mph and 1.9mph (indicating more consistency in the driving speeds on 20mph limit roads). These changes are all expected to have had a positive influence on collision and casualty numbers.

Change in driver awareness – A net proportion of non-resident drivers agreed that 20mph limits increase driver awareness of potential risks and hazards (58% agreed, 13% disagreed); but residents were more likely to disagree (30% agreed, 40% disagreed)³⁸. The results suggest that there are mixed views on whether 20mph limits are perceived to have a positive influence on driving standards; and there is insufficient evidence to determine whether driver awareness has had a positive influence on reducing collisions.

Change in traffic flow – The traffic data available for Brighton Phase 1 for the before and after periods³⁹ suggests that a reduction in traffic flow on A roads (-4%) has contributed to the large change in collisions on 'major strategic roads', but is unlikely to be the key driver of change. On important local roads, the significant reduction in collisions appears to have occurred against a backdrop of little change in traffic (-1%). On minor local roads, the significant reduction in collisions appears to have occurred despite a reported 8% increase in traffic on these roads.

Other factors – There is no substantial evidence to suggest that the identified change is due to a change in road safety policy or collision reporting processes.

Summary – Based on the evidence currently available, the conclusion is that the introduction of 20mph limits on higher flow roads has contributed to the significant reduction in the number of collisions and casualties recorded within the Brighton Phase 1 area, based on three years of post implementation data. However, collisions are known to fluctuate over time and further data is required to determine the longer term impacts of the speed limit change.

There has been a small reduction in speeds which is expected to have had a positive influence on safety outcomes, but there is insufficient evidence to determine whether drivers in Brighton are now more aware of hazards and risks, and whether this has influenced the number of collisions in the after period. A reduction in traffic flow on A roads has contributed to the large reduction in collisions on 'major strategic roads', but is

³⁸ Non-resident drivers sample = 131. Residents sample = 201.

³⁹ Evidence from the GB Road Traffic Count data collected by DfT shows a 4.1% reduction in annual traffic flow on major A roads in Brighton Phase 1, comparing average annual flow six years before implementation and four years post implementation. Data was also collected by the local authority over a 7 day period in Jun 2013 (just prior to implementation) and Jun 2015 (just over two years post implementation). Data was collected at 15 sites on important local roads (FRC4-5) and 37 sites on minor local roads (FRC6-7).

unlikely to be the key driver of change given the scale of reduction in collisions on major strategic roads. Changes in traffic flow do not appear to have contributed to the significant reduction in collisions on 'important local roads' and 'minor local roads'.

7.2.4. Overall

This study has examined the short-term changes in collisions and casualties across the case study areas.

In the majority of the case studies (including the aggregated set of residential case studies) the evidence available to date shows no significant change in collisions and casualties in the short term. While a number of individual case studies show a greater reduction in collisions / casualties than in the corresponding comparator areas, these results are based on very small sample sizes and it is not possible to attach any confidence to their significance.

There is some evidence to suggest a positive 20mph impact in one location (Brighton Phase 1). Here a blanket 20mph limit was introduced covering both major and minor roads and there is sufficient data for a statistical test to show a statistically significant change in collisions and casualties relative to the 30mph comparator area. It should be stressed that this represents just one case study, and the extent to which the findings are transferable to other locations is unclear.

In both cases, further data is required to determine the long term impact of 20mph limits. Collision and casualty rates are known to fluctuate from year to year, and the post implementation data currently available may not be indicative of the longer term trend.

Wider evidence on signed only schemes is limited, and tends to be based on short periods of 'after' data. In general, the studies have not compared against background trends or have compared changes against those observed on more major roads.

7.3. Has there been a change in collision contributory factors?

Table 4 shows that the most common contributory factors on case study area roads are all related to the failure to observe what is happening on the road network: Driver failed to look properly (37%), Pedestrian failed to look properly (17%), Failed to judge other person's speed (15%). Slower speeds provide more time for road users to observe and respond to hazards, and are expected to lead to a reduction collision associated with these factors. However, it is also possible that reducing the speed limit may make pedestrians complacent or drivers frustrated, resulting in an increase in 'failed to look properly' incidents or frequency of 'careless/reckless' behaviour.

Seven of the top ten contributory factors within the case study areas are also present within the list of top ten contributory factors nationally. The exceptions are Pedestrian – Careless/reckless/in a hurry (7%), Disobeyed stop sign/markings (5%), and Stationary or parked vehicles (5%); a reflection of the case study characteristics and the fact that 20mph limits have generally been introduced on minor roads with more pedestrian activity.

Table 4. Contributory factors associated with collisions in case study areas prior to implementation (findings to be treated as indicative only, due to dataset limitations)

Top 10 contributory factors (vehicles unless stated)	Case study areas		GB 2015 Top 10 contributory factors	
	No.	%	Rank	%
Failed to look properly*	528	37%	1	46%
Pedestrian - Failed to look properly*	248	17%	6	9%
Failed to judge other person's speed*	219	15%	2	23%
Poor turn or manoeuvre	171	12%	4	17%

Top 10 contributory factors (vehicles unless stated)	Case study areas		GB 2015 Top 10 contributory factors	
	No.	%	Rank	%
Careless/ Reckless/ In a hurry*	162	11%	3	19%
Pedestrian - Careless/Reckless/ In a hurry*	98	7%	N/A	N/A
Slippery road (due to weather)	87	6%	7	8%
Loss of control*	80	6%	5	13%
Disobeyed Stop sign / markings	77	5%	N/A	N/A
Stationary or parked vehicles	75	5%	N/A	N/A

*Factors most likely to be affected by a change in speed limit are highlighted in pink.

A comparison of the occurrence of the above factors in the before and after periods has been undertaken. The findings should be treated as indicative only due to the limitations of the dataset, and further evidence is required to draw firmer conclusions.

The most common contributory factors in the 20mph limits include a mix of factors, with some of them likely to be affected by changes in vehicle speeds and others less so. Both types of factors show percentage point changes in frequency, demonstrating the difficulty in analysing what impact, if any, has occurred due to the introduction of 20mph.

Some driver-related factors which were expected to be less prevalent in 20mph limits (e.g. Failed to look properly, and Failed to judge other person's speed) have actually increased after scheme implementation.

Concerns that reducing the speed limit to 20mph may make pedestrians more complacent are not validated, with pedestrian-related factors (e.g. Pedestrian - Failed to look properly, Pedestrian - Careless/Reckless/In a hurry) showing no significant change or a small decrease in frequency after 20 mph limits were implemented.

However, the data does provide some tentative evidence to support concerns that lowering the speed limit may increase driver frustration and distraction, with a significant increase in the proportion of collisions categorised as 'Careless / reckless / in a hurry'. As highlighted above, further evidence is required to draw firmer conclusions.

None of the factors differ significantly between the before and after periods when analysed separately for residential and city centre schemes; and further data is required to provide more robust findings.

7.4. Is there any evidence of negative safety impacts on neighbouring roads?

Collision migration (or savings) may occur as a result of positive or negative changes in speed compliance or driver attention when leaving the 20mph road. Analysis of area-wide journey speeds (see Section 4.6) shows no evidence to suggest that drivers are going faster than previously when leaving the new 20mph limit areas. However, driver attention may be higher than previously (due to increased awareness of hazards when driving through the 20mph limit), leading to fewer collisions on surrounding roads; or lower than previously (due to increased levels of frustration), leading to more collisions on surrounding roads.

Further safety analysis was therefore undertaken to examine any impact on 30mph roads surrounding the 20mph limit schemes; using the same methodology as that for the 20mph analysis. Hence, 30mph roads in the vicinity of the case study areas were entered into a statistical model along with comparator area roads (30mph roads in similar non-case study areas) to control for background changes in collision rates.

This analysis shows no evidence of collision migration in most of the case study areas. However, in both the Liverpool case study areas the number of collisions decreased by a significantly smaller amount than the reduction observed in the north-west comparator area, where a substantial decline was recorded. The reasons for the decline in the comparator area are unclear⁴⁰, leading to uncertainty about whether there has been a slower decrease in collisions in the Liverpool case studies as a result of drivers speeding up and/or driving less safely when leaving the 20mph limit.

⁴⁰ However, discussions with Transport for Greater Manchester identified two factors which may have contributed to the trend. Firstly, the closure of public counters and phone lines at some police stations, making it more difficult for public to report collisions which have not been attended by the police. Secondly, increasing levels of congestion, partly linked to roadworks associated with development and construction sites, which may have reduced speeds and collisions on 30mph roads.

8. How have route choice and journey times changed?

8.1. Introduction

This chapter examines the impact of new 20mph limits (signed only) on route choice and journey times.

8.2. How has route choice changed?

Despite some evidence of driver frustration, only 8% of (non-resident) drivers said that they avoid driving in the area, and only 4% of residents felt that there are less vehicles using their road. Even with the lower speed limit, the 20mph roads still appear to provide a more direct and convenient route. The vast majority of drivers do not appear to have changed their route to avoid the new 20mph limit areas.

This is not surprising. The widespread nature of most of the schemes and the fact that the majority of traffic in residential case study areas is expected to be travelling to/from home, means that in most cases there will be few alternative routes available (resulting in limited displacement of traffic). Furthermore, analysis shows that 44% of drivers in residential case studies and 59% in the city centre case studies were already driving below 20mph; and the median area-wide journey speeds have fallen by less than 1mph, resulting in a minimal impact on journey times (see below).

8.3. How have journey times changed?

Journey times are estimated to have increased by 3% in residential areas and 5% in city centre areas, based on the observed change in median speed (from GPS journey speed data). This adds less than half a minute to a two mile trip and less than a minute to a five mile trip (Table 5).

Table 5. Calculated change in average journey time for a 2 and 5 mile trip

	Journey times for a 2 mile trip			Journey times for a 5 mile trip		
	Before	After	Diff	Before	After	Diff
Residential case study areas	5.7 mins	5.9 mins	0.2 mins (3%)	14.2 mins	14.6 mins	0.4 mins (3%)
City centre case study areas	6.7 mins	7.0 mins	0.4 mins (5%)	16.7 mins	17.5 mins	0.9 mins (5%)

In most of the case study areas, major roads have been excluded from the limit. The distance travelled on 20mph roads is expected to be substantially less than the 2 or 5 miles assumed above, and hence, the journey time impact will be a few seconds only. Most drivers are unlikely to notice this level of change. Furthermore, a substantial proportion of drivers were already travelling at less than 20mph and are unlikely to have experienced a change in journey times.

It is also worth pointing out that delay at junctions can have more of an impact on overall journey times and is unlikely to be affected by the 20mph limits.

There is no evidence from the focus groups that residents are concerned about increased journey times. There may be instances however, where drivers have found that routes previously used as short cuts no longer seem attractive and are perceived to result in additional journey time (regardless of the actual time difference).

Impact on bus operators – Some concerns were raised by bus operators in residential case study areas, due to the impact on bus reliability and operating costs. In one case, the operator reported that new 20mph limit meant that they were unable to maintain the tight timetable on one route and had to introduce an additional vehicle into the service. Elsewhere, operator concerns were addressed by retaining a 30mph limit on key bus routes; or concerns reduced over time.

9. How has mode use changed?

9.1. Introduction

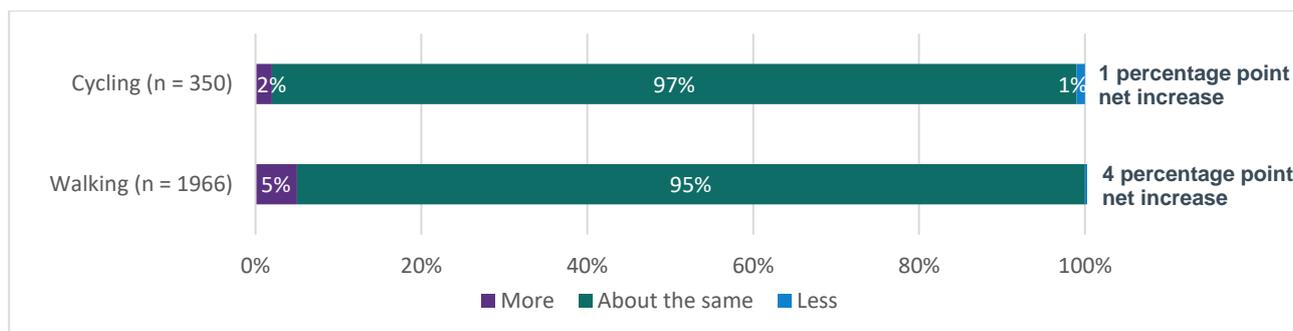
This chapter examines the impact of new 20mph limits (signed only) on the use of active travel modes (walking and cycling) and likelihood of mode shift (from using a car or van to walking or cycling).

9.2. Has use of active travel modes changed?

Self-reported levels of walking and cycling – The majority of residents (69%) agreed that 20mph limits are beneficial for walking and cycling. However, in most cases this has not been translated into an increase in actual levels of walking and cycling, with nearly all residents saying that they are walking (95%) and cycling (97%) ‘about the same’ amount as before the 20mph limit was introduced.

Nevertheless, there has been a small (but significant) increase in the proportion of survey respondents stating that they have increased their use of active travel modes. Some 5% of residents surveyed said that they are walking more, and 2% said that they are cycling more, since the introduction of the 20mph limits (Figure 12).

Figure 12. Since the introduction of the 20mph limit, are you now walking / cycling more, less or about the same than previously?



Residents questionnaire. n = sample size.

In addition, a small proportion of households with children reported that their children are cycling locally more often since the introduction of 20mph limits (9% of households for children aged 6-10 years, 6% of households for children aged 11-14, and 6% of households for children aged 15-17)⁴¹.

Furthermore, the speed limits are expected to reinforce cycling behaviour amongst existing regular cyclists: 59% of those responding to the cyclists’ online survey said that keeping the traffic below 20mph means that they are more likely to cycle to local places.

The results suggest that while the introduction of a 20mph limit is perceived as a largely positive measure for pedestrians and cyclists; infrastructure-related barriers to walking and cycling remain (see Chapter 9) and the change in reported levels of walking and cycling undertaken by residents in general appears to be small (but statistically significant).

This is perhaps not surprising as research suggests that (in addition to the need to address wider physical aspects of the walking and cycling environment), other personal and psychological factors are important, including recognition of the benefits of changing behaviour and perception that it’s the right thing to do from a personal, social, environmental perspective; knowledge about the options available and experience of using these modes; and perceptions about time and cost implications. In addition, change in mode use is often a process rather than a result of a one-off decision triggered by a specific event (e.g. change of job, moving house, change in life circumstances). While consultation and engagement activities have contributed to high levels of support and awareness of the potential benefits, particularly in some case study areas, this has not

⁴¹ Sample sizes for the three different age categories are 221, 181, and 154 respectively.

been sufficient to encourage many residents to change their behaviour over the time period covered by this research.

Note - The above results are based on self-reported perceptions of behaviour change, and may not accurately reflect the real change in the frequency and amount of walking / cycling activity undertaken.

Re-routing to 20mph roads – As reported in Chapter 6, around half (49%) of existing regular cyclists prefer to cycle on 20mph roads. However, only a quarter (27%) re-route to use 20mph roads, suggesting that convenience outweighs preference for 20mph for most regular cyclists. Re-routing to 20mph roads may be higher amongst less experienced and less confident cyclists, but it has not been possible to test this.

9.3. What is the likelihood of mode shift away from car?

A significant minority of residents said that keeping traffic below 20mph makes it more likely they will walk (16%) or cycle (9%) to local places rather than use the car. Actual mode shift activity is likely to be much less prevalent, but cannot be determined from this data. Changes may occur over time, as a result of the cumulative effect of other sustainable travel interventions or changes in individual circumstances.

10. What impact do 20mph limits have on the community, the local economy, environment and health?

10.1. Introduction

This chapter covers the potential wider impacts of 20mph limits (signed only) associated with changes in driver behaviour, perceptions about walking and cycling, safety, journey time impacts, use of active travel modes and mode shift described in previous sections.

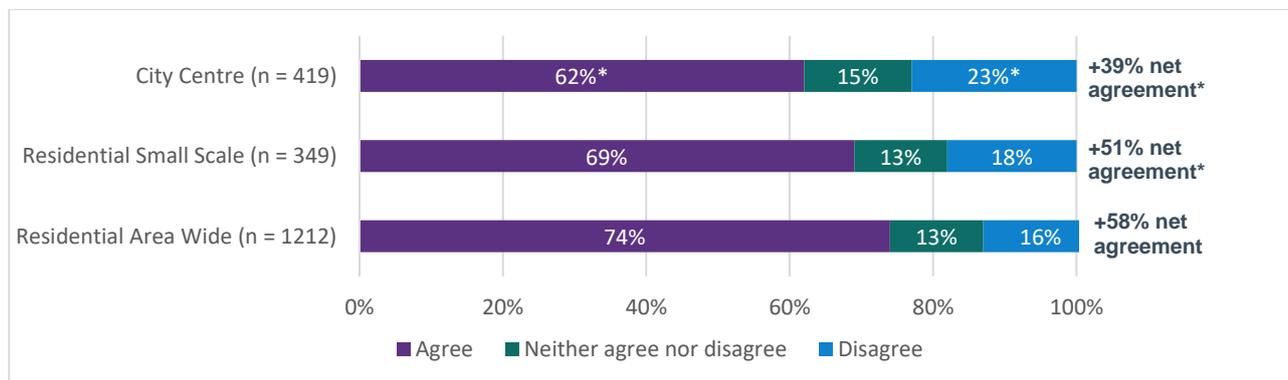
It focuses on social and community impacts; and potential impacts on the local economy, the environment (air quality, greenhouse gas emissions, noise), and health.

No primary data has been collected for environmental and health benefits. For these sections, the likely impacts are set out, based on existing research and observed changes in influencing factors.

10.2. Have there been any social and community impacts?

The majority of residents (70%) agreed that the 20mph speed limit is beneficial for residents. The proportion is higher in area-wide residential areas (74%), and amongst non-drivers (74%). Focus group participants also tended to see the 20mph limits as a positive change.

Figure 13. The 20mph limit is beneficial for residents (by area type)



Residents questionnaire. n = sample size.

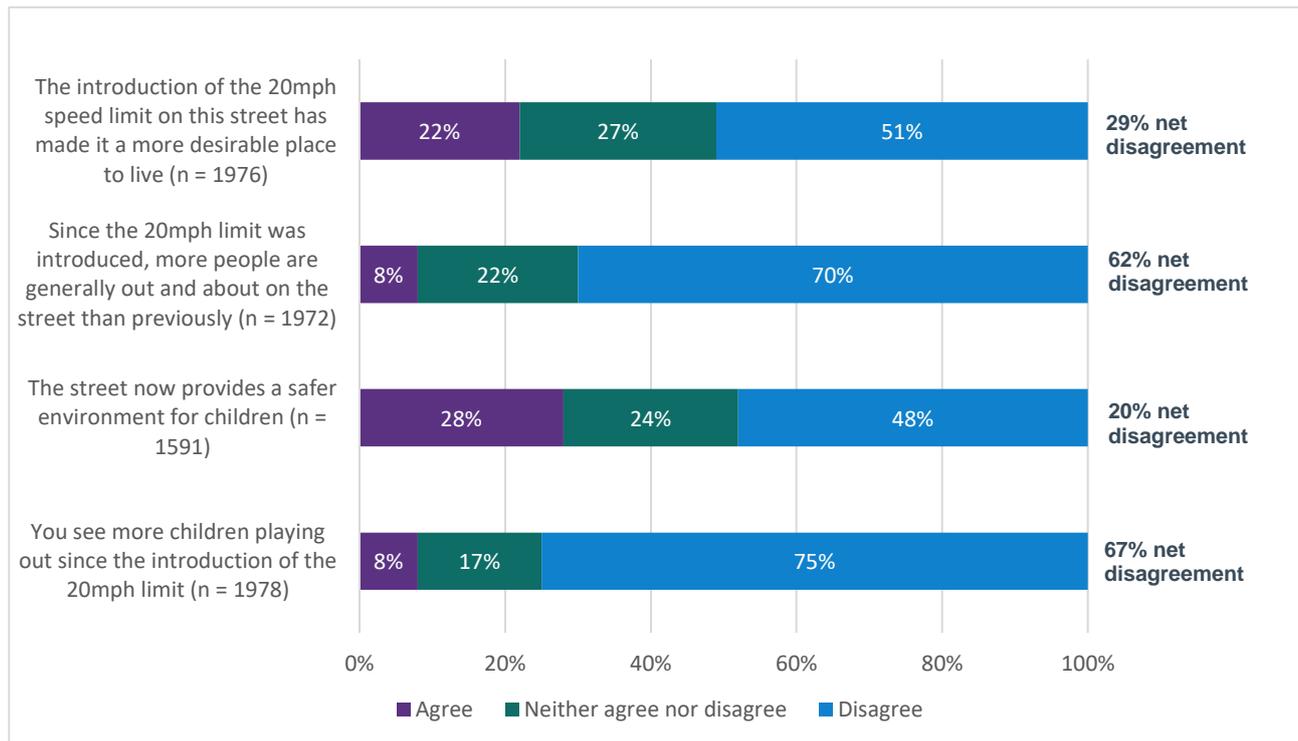
Significant differences in Residential Area Wide vs Residential Small Scale, and Residential Area Wide vs City Centre results marked with asterix (*).

However, child safety still appears to be a concern, and other potential benefits relating to social interaction (residents out and about on the street) and community pride do not appear to be recognised by the majority of residents (Figure 14).

Some 7% of households with children aged 6-10 years and 5% of households with children aged 11-14 reported that their children play outdoors more often since the introduction of 20mph limits⁴².

⁴² Sample sizes for the three different age categories are 221 and 181 respectively.

Figure 14. Social and community impacts

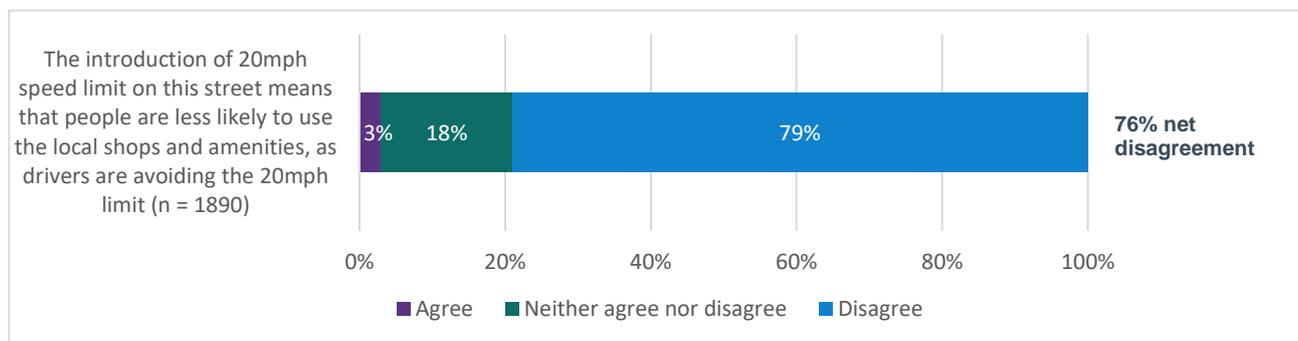


Residents questionnaire. n = sample size.

10.3. Have there been any impacts on local shops and amenities?

Very few residents (3%) believed that the new speed limit means that people are avoiding the area and are less likely to use local shops and amenities (Figure 15).

Figure 15. Impact on the local economy



Residents questionnaire. n = sample size.

10.4. What are the likely impacts on the environment?

Existing research suggests that 20mph limits (signed only) have the potential to affect vehicle emissions and air quality, reduce CO₂ (greenhouse gas) emissions, and reduce noise levels, as a result of:

- a reduction in average speed and top percentile speeds;
- a smoother, more consistent driving speeds;
- a small-scale displacement of traffic; and
- mode shift away from car.

Evidence from this study suggests that these factors are unlikely to have had a negative influence on air quality in the case study areas, however, it has not been possible to collect primary data on air quality, greenhouse gas emissions and noise levels to assess the impact.

Existing research on these relationships is complex and is set out in the Process and Impact Evaluation Technical Report.

10.5. What are the likely impacts on health?

Existing research suggests that 20mph limits (signed only) have the potential to improve health and well-being and reduce pressure on the NHS, as a result of an overall increase in use of active travel modes, and an overall reduction in injuries from vehicle collisions as a result of a reduction in speed (although this study has not been able to confirm this based on the data currently available for analysis).

However, there is also potential for some health benefits to be offset as a result of an increase in collisions involving pedestrians and cyclists (no evidence of this found in this study), and increased exposure to vehicle emissions (not tested as part of this study).

It has not been possible to collect primary data on health benefits as part of this study. However, existing research on these relationships is set out in the Process and Impact Evaluation Technical Report.

11. How do outcomes compare with 20mph zones and older limits?

11.1. Introduction

This chapter examines how outcomes of 20mph (signed-only) limits, which form the main focus of this research, compare with those of new 20mph limits (with existing physical traffic calming measures), and with older 20mph limits (with calming and signed only). It focuses on levels of support, perceived benefits / dis-benefits, speed compliance and change in speed, based on findings for the case study areas.

This study has not collected any new primary evidence on safety outcomes (impact on collisions and casualties) or wider impacts (e.g. air quality, noise emissions). However, reference is made to previous research, where relevant.

11.2. How does support for 20mph limits and zones compare?

20mph limits (with physical traffic calming measures) (also referred to as 20mph zones) are seen as a more effective means of slowing traffic down (by focus group participants, drivers interviewed, and respondents to the cyclists and motorcyclists surveys). However, they are less popular amongst drivers, motorcyclists and cyclists, than 20mph limits for a range of reasons:

- Drivers expressed concern about damaging their vehicles.
- Physical measures can encourage erratic or unpredictable driving, with vehicles speeding between or after road humps / speed cushions, or swerving to avoid partial speed humps or chicanes, increasing the likelihood of conflict with other road users.
- Road humps / speed cushions can be slippery in wet weather and awkward for motorcyclists and cyclists to ride over, particularly for inexperienced riders.
- Road humps are perceived to increase noise and air pollution.

11.3. How do speeds compare in 20mph limits and zones?

11.3.1. How have speeds changed in new 20mph limits, with and without calming?

Some case study roads where the speed limit changed from 30mph to 20mph already had traffic calming in place, in the form of speed humps / tables or chicanes. These have essentially become new 20mph zones.

Journey speed data shows that, post implementation of 20mph limits, there is a higher level of compliance on already traffic calmed roads (62%), than on signed only roads (47%). However, comparison of the before and after scenarios suggests that speeds have reduced less on already traffic calmed roads (-0.2 vs -0.7mph in terms of the median speed) (Table 6).

Speeds were already lower on these roads, prior to the change in limit. It appears that the presence of physical measures (road humps, chicanes) has already encouraged drivers to change their behaviour and to adopt slower speeds, leaving little scope for a further reduction in response to the lowering of the speed limit.

Table 6. Comparison of speeds - New 20mph limits (signed only vs. existing calming), based on GPS journey speed data

	Proportion driving less than 20mph		Change in median speed	Change in 85 th percentile speed
	Before	After		
New 20mph limits (signed only) – Main focus of study	44%	47%	-0.7mph	-1.1mph
New 20mph limits (existing calming) (i.e. zone)	60%	62%	-0.2mph	-0.6mph

Residential areas only.

11.3.2. How have speeds changed in new 20mph limits, compared with older limits and zones?

Almost all of case studies had the some pre-existing 20mph limits (signed only and with calming) in place prior to the implementation of the main area-wide scheme; often located outside schools. These roads did not experience a change in limit over the course of the research, but driver behaviour may have been influenced by the introduction of a new 20mph limit over the wider area.

Table 7 compares speed changes in the new 20mph (signed only) limits, which form the main focus of the study, with the changes observed on older 20mph limits (signed only and with calming) over the same time span, to identify any associated effects.

Table 7. Comparison of speeds - New 20mph limits (signed only) vs older limits (signed only and with calming), based on GPS journey speed data

	Proportion driving less than 20mph		Change in median speed	Change in 85 th percentile speed
	Before	After		
New 20mph limits (signed only) – Main focus of study	44%	47%	-0.7mph	-1.1mph
Old 20mph limit (with calming) (i.e. zone)	67%	66%	+0.2mph	+0.3mph
Old 20mph limit (signed only)	65%	68%	-0.4mph	-1.3mph

Residential areas only.

Comparison with older 20mph limits (with calming) – Older 20mph limits (with calming), demonstrate a higher level of ‘after’ compliance than the new 20mph limits (66% vs 47%). This could be because compliance improves over time, and the older 20mph zones have had their speed limit in place for longer. Alternatively, it could be that the new 20mph roads have characteristics which mean that drivers are instinctively less likely to slow down (e.g. wider, straighter, busier roads, etc.).

There has been little change in speed on these roads over the course of the research, with the median changing by +0.2mph. However, speeds were already low (17.0mph median speed), and around two-thirds of drivers were already travelling at less than 20mph.

It appears that extending the area covered by 20mph limits has not changed driver behaviour in existing (older) 20mph zones.

Comparison with older 20mph limits (signed only) – Older 20mph limits (signed only), also demonstrate a higher level of ‘after’ compliance than the new 20mph limits (68% vs. 47%). Again, this could be because the older 20mph limits (signed only) have had their speed limit in place for longer; or it could reflect the characteristics of the roads.

Over the period of research, the older 20mph limits (signed only) show a similar reduction in speed to that observed on new 20mph limits (signed only), at least in terms of the higher end speeds (e.g. -1.3mph vs -1.1mph based on the 85th percentile speed). This is despite the fact that the speed limit has been 20mph throughout the period, and the fact that speeds were already low on these roads (e.g. 16.5mph vs 21.1mph based on the median speed).

Summary – While extending the area covered by 20mph limits has not changed driver behaviour on older 20mph limits (with calming), it appears that there has been some speed reduction on older 20mph limits (signed only). It is possible that the presence of calming (road humps, chicanes) and the nature of the associated roads (which are nearly all minor local roads) has already encouraged drivers to reduce their speed as much as they are willing to do so, in the absence of more proactive enforcement.

However, on older 20mph limits drivers may have been encouraged to reduce their speeds further, in line with their behaviour on new 20mph limits. The sample size for older 20mph limits is smaller than for the other categories of road, and further evidence is needed to support this conclusion.

11.4. How do safety outcomes compare in 20mph zones and limits?

Previous research suggests that 20mph zones can result in sizeable reductions in collisions and casualties, when compared with the 20mph limits in the case study areas:

- Webster and Mackie (1996) reported a 60% reduction in annual accident frequency for 72 zones implemented across England in the early 1990s. This research made no allowance for background trends.
- Webster and Layfield (2003) reported a 42% reduction in the annual frequency of injury accidents for 78 zones implemented in London in the late 1990s, after allowing for background changes in accident frequency on unclassified roads.
- Brightwell (2003) reported a 56% reduction in annual collisions across 120 zones in Hull, between 1994 and 2001. This research made no allowance for background trends.
- Grundy et al. (2009) reported a 42% reduction in annual casualties across 200 zones in London, between 1986 and 2006, after adjusting for background trends.

However, the scale and character of the 20mph zones examined differ substantially from the 20mph area-wide limits implemented in the case study areas. The zone-based schemes previously examined typically covered a few kilometres of road length, had a before speed well above 20mph, and were implemented to address location-specific safety issues.

11.5. How does use of active travel modes compare in 20mph limits and zones?

An umbrella review of the effects of 20mph zones and limits by Cairns et al. (2014) found mixed evidence regarding walking and cycling levels. Kirby (2001) assessed 20 mph zones in Hull, and found that 25% of residents reported walking or cycling more and 60% felt that more children played outside as a result of the scheme. However, studies by Webster et al. (2006) and Battie (2001) found no significant changes in cycling, walking or children playing outdoors, and a study by Social Research Associates (2001) reported a negative effect of 20 mph zones with unanticipated declines in walking and cycling.

11.6. How do environmental outcomes compare in 20mph limits and zones?

Existing research suggests that, relative to 20mph limits, 20mph zones have an adverse effect on air quality (e.g. Pharoah, 1991; Litman, 1999; Boulter et al., 2001; Daham et al., 2005; Williams, 2013) and noise levels (e.g. Pharoah and Russell, 1989; Taylor et al., 1997; Kennedy et al., 2005; Bellefleur and Gagnon, 2011) due to vehicles accelerating and braking more frequently, resulting in higher tailpipe emissions, braking dust and tyre wear, and noise emissions. As on all roads, the impact can be exacerbated by high traffic flows and is heavily dependent on the vehicle types using the road in question.

12. Conclusions and considerations for decision-makers

12.1. Introduction

This study substantially strengthens the evidence base on perceptions, speed and early safety outcomes associated with 20mph (signed only) limits. It is the only major UK study to date to consider multiple case study areas and provide a national view. It combines evidence from 12 case study schemes comprising over 700kms of new 20mph (signed only) limits and uses data from comparable locations where 20mph limits have not been introduced to control for background trends. It brings together a wide range of qualitative and quantitative material, to provide robust evidence on observed and perceived outcomes following the implementation of 20mph (signed only) limits.

Feedback from over 5,400 questionnaires with a range of road users is used to identify perceptions about 20mph limits and changes in personal driving / riding behaviour. Analysis of speed outcomes is based on over 18 million vehicle kilometres of journey speed data from in-car GPS devices, and spot speed (instantaneous speed) data from over 400 locations. Just under 4,000 collisions have been analysed to examine early safety outcomes in 20mph limit areas. Evidence on mode use impact is based on self-reported behaviour change identified through questionnaire surveys and an investigation of associated factors.

This study has not sought to collect primary data on wider impacts relating to the local economy, the environment (greenhouse gas emissions, air quality, noise) and health. Existing empirical evidence is weak, inconclusive, or complex (particularly regarding air quality) and there remains an evidence gap regarding the impact of 20mph limits on these areas.

In summary, this study provides substantial new evidence on the implementation of 20mph limits, their effectiveness in a range of contexts, and lessons and considerations for policy and decision-makers. The key findings and conclusions in relation to each of these issues are set out below.

12.2. How has Circular 01/2013 been implemented?

In 2013, DfT provided revised guidelines on the setting of local speed limits (DfT Circular 01/2013). The guidance says that authorities can set 20mph speed limits in areas where local needs and conditions suggest that the current limit is too high. Traffic authorities are asked to have regard to this guidance, but it is not mandatory. Instead, it is about empowering local highways authorities and local people to make decisions that take into account local circumstances and needs. The key themes set out within the guidance are identified Table 8, along with a summary of the local authority response. In general, local authorities have responded positively to the guidance and largely followed the guidelines set out in the document.

Table 8. Local authority response to Circular 01/2013 in case study areas

Guidance theme	Local authority response
Consider more 20mph limits, over a larger number of roads where mean speeds are already at or below 24 mph on a number of roads (para 97)	<p>Substantial growth in area-wide limits in recent years, covering larger areas and often entire urban areas.</p> <p>Over the last few years a large and growing number have implemented area-wide 20mph limits. In 2016, the Department for Transport asked all local authorities to provide details of the length of road with a permanent 20mph limit (signed-only or with physical calming) in their local authority area. Across the 39 authorities responding, the length of 20mph road had increased from 1,474kms in 2010 to 4,787kms in 2015, an increase of 225%⁴³.</p>

⁴³ The local authorities with the greatest coverage of 20mph limits were: Sefton (800kms in 2015); Wigan (750kms in 2015); Nottingham (580kms in 2015); Southwark (336kms in 2015); Camden (258kms in 2015). Some authorities with greater coverage may not have responded.

	<p>A survey by Brake in June 2015⁴⁴ estimated that 21% of councils in Great Britain had introduced widespread signed-only 20mph limits or made a commitment to do so, and a further 36% had limited trials in place. However, 43% had no area-wide limits in place or plans for such schemes. This proportion is believed to have decreased in recent years, but further data is required to confirm this.</p> <p>Knowledge gained through the course of this research suggests that the majority of 20mph limits implemented are focused on residential areas, but a substantial number of town and city centre schemes have also been implemented.</p> <p>However, not all local authorities are implementing 20mph limits.</p> <p>Although a substantial proportion of local authorities have implemented area-wide 20mph limits, some have chosen not to (estimated at less than half, based on the above evidence). Feedback from three case study authorities which have made a decision not to implement 20mph limits suggests that these decisions have been driven by lack of definitive proof about the tangible benefits of schemes, and opposition from the local community and local councillors. The Councils concerned were not able to provide evidence to clearly demonstrate the scheme rationale, objectives and outcomes, and ultimately were not able to secure buy-in from key stakeholders.</p>
<p>Most appropriate where the mean speed is already at or below 24mph (para 95)</p>	<p>The majority of 20mph limits have been implemented on roads with average vehicle speeds below 24mph.</p> <p>Circular 01/2013 suggests that where mean speeds exceed 24mph the introduction of signage only is unlikely to lead to compliance, and 20mph limits are therefore most appropriate where the mean speed is already at or below 24mph.</p> <p>Spot speed data shows that 86% of roads in the pioneering Portsmouth scheme (which formed the basis for the guidance set out in Circular 01/2013) had a mean before speed below 24mph. The rest of the case studies were implemented more recently and typically included a lower proportion of roads with before mean speeds below 24mph, varying from between 20% and 72% and equating to 59% overall. However, the number of sites surveyed in these areas was substantially less than in Portsmouth and known to be biased towards sites where higher speeds were expected. The actual proportion with a before mean speed below 24mph, taking all roads into account, is therefore likely to be higher.</p> <p>Some authorities reported that they had decided to include streets with higher limits to avoid isolated 30mph roads and to provide consistency in signage and road user perceptions. Others deliberately excluded streets with average speeds of more than 24mph or with known speeding issues.</p>
<p>Consider introducing 20mph limits on major streets (as well as residential streets) where foot and cycle movements are important and this outweighs the disadvantage of longer journey times for motorised traffic (para 84)</p>	<p>Major streets excluded from a number of schemes</p> <p>The area-wide residential case studies considered within this study typically exclude major streets such as strategic routes (A and B-class roads), key bus routes, distributor roads, and streets with non-residential frontages. In some of these locations, the road's function and the mix of traffic it carries means that motor traffic is the primary consideration.</p> <p>However, the two city centre case study schemes both comprise a blanket 20mph limit, which includes more strategic A and B-class roads with higher traffic flows, giving more importance to pedestrian and cycle movements across the entire area. It is interesting to note that in these particular case studies, the average before speed was less than in the residential case study areas⁴⁵.</p>

12.3. How effective have 20mph limits been?

Level of support – The study shows that 20mph limits are generally supported and there is little call for the limit to be changed back to 30mph; even though most residents and users do not perceive vehicle speeds to have changed. Local residents and other road users generally perceive the 20mph limits as beneficial for local residents, pedestrians and cyclists. From a driver perspective, they make driving at a slower speed more acceptable.

Speed outcomes – Journey speed analysis (based on in-car GPS data) shows that in the case study areas, the majority of drivers are travelling less than 24mph (i.e. at speeds close to 20mph): 70% in residential

⁴⁴ Brake (2015); *GO20 Towards changing the default urban speed limit to 20mph*. Information was requested from all 206 local traffic authorities in Great Britain, of which 122 replied.

⁴⁵ It appears that the presence of congestion, pedestrian and cyclists, crossing points, parking and buses, may have influenced the speed at which drivers were able or chose to drive in city centre areas, with 59% already driving at less than 20mph.

areas and 86% in city centre areas. This represents a small increase on the before situation: 65% in residential areas and 79% in city centre areas. The nature of the roads where the limits have been introduced means that in many cases lower speeds were already 'self-enforced'. Reducing the speed limit to 20mph has helped reinforce this process.

Following the introduction of 20mph limits (signed only) the median speed has fallen by just under 1mph, with faster drivers reducing their speed more. The evidence suggests that this is partly due to the implementation of 20mph limits, but also reflects background trends in speed on urban roads.

- In residential case study areas, the introduction of 20mph limits is estimated to have resulted in a 0.8mph reduction in median speeds and a 1.1mph reduction in 85th percentile speeds⁴⁶ on 'important local roads'⁴⁷.
- In city centre case study areas, the analysis shows a 0.6mph reduction in median speeds and a 1.0mph reduction in 85th percentile speeds.

These figures are in addition to a small background reduction in speeds which appears to have occurred on urban roads with similar characteristics to the case study areas.

These findings are broadly consistent with previous research⁴⁸ which reports reductions in mean speed of 0.5mph-2.0mph based on instantaneous spot speed data⁴⁹, and with variable accounting for background trends. The modest scale of speed reduction is not surprising, as a substantial proportion of drivers were already travelling at speeds close to 20mph prior to the introduction of the new limits. The fact that faster drivers have reduced their speed more is encouraging as other research shows that higher speeds are associated with increased safety risk (more collisions, increased severity, and perceptions that the environment is not safe for vulnerable users).

The study has shown that the speed at which people drive is influenced more by the look and feel of the road, than whether a 20mph or 30mph limit is in place. It appears that some roads where 20mph limits have been implemented are naturally 'self-explaining roads' where drivers 'instinctively' drive more slowly (because their length provides less opportunity to build-up speed, visibility may be limited, drivers do not feel that they have sufficient space to drive faster or feel that it is appropriate to do so, and because they serve local start/end destinations only). In other cases, the look and feel of the road naturally encourages higher speeds. In many cases the implementation of a 20mph limit has simply formalised existing behaviour.

The challenge is how to change driver attitudes and behaviour in other locations. Evidence from this study (and others⁵⁰) shows that bigger speed reductions occur on faster roads, with higher volumes of traffic and providing a locally important strategic function. Circular 01/2013 encourages authorities to consider introducing 20mph limits on more major streets where foot and cycle movements are important, but also advises that where average speeds exceed 24mph, the introduction of signage only is unlikely to lead to 20mph compliance. This study supports this advice and confirms that on faster roads more needs to be done to achieve compliance and maximise the benefits. Even on these types of roads the actual reduction in speeds has been small, with lowering the speed limit using signs alone leading to a reduction in speed of about 1mph. Without supporting measures to encourage compliance, there is a risk that non-compliance with the speed limit becomes the norm.

Introducing physical traffic calming or changing the design of the streets represents one approach to improving compliance. However, more realistically it needs to be about changing how drivers think about driving in residential areas and locations with significant pedestrian and cycle activity. This is likely to require high profile and integrated engagement activity. 20mph schemes have the potential to deliver a range of transport and other benefits (particularly relating to health and community). This provides an opportunity for scheme promoters to work and engage with a range of policy and interest groups to reinforce messages

⁴⁶ The 85th percentile speed is the speed that 85 percent of vehicles do not exceed. Only 15 percent of vehicles go faster than this speed, and 85 percent go at or below this speed. It is regularly used in traffic engineering as a standard to set safe speed limits and in the design of roads.

⁴⁷ Case study roads have been classified as 'minor local roads', 'important local roads', and 'major strategic roads' using TomTom's Functional Road Classes, which provides a proxy for the size, nature and purpose of each road.

⁴⁸ E.g. Burns A, et al. (2001), Atkins (2010), Bristol City Council (2012), Edinburgh City Council (2013), and Pilkington et al. (2018).

⁴⁹ Spot speed surveys generally record higher average and 85th percentile speeds as they measure instantaneous speed at a specific location.

⁵⁰ Pilkington et al. (2018).

about the rationale and potential benefits of 20mph limits. The most effective schemes are likely to be those which are based on a broad integrated policy agenda (involving health, environment, urban planning, emergency services, education, community representatives, etc.). Longer-term 20mph schemes which are supported by complementary transport, health, environment and community policy and interventions are likely to deliver greater benefits.

Enforcement – Although 20mph limits are intended to be self-enforcing, policy makers need to acknowledge that the most common area of concern amongst the public was around compliance, with most focus group and survey participants of the opinion that stronger enforcement measures are needed if 20mph limits are to be effective. There is a widespread view amongst the public that 20mph limits are not enforced, and the likelihood of being caught exceeding the limit is very small. This is one of the reasons why bigger reductions in speed have not been observed in scheme areas.

Feedback from the case study authorities suggests that what the police say about enforcement is can be important in terms of how 20mph limits are perceived by the local community.

Early safety outcomes – There is an established positive relationship between vehicle speed and injury collisions⁵¹ – the higher the speed, the more collisions and where collisions do occur, the higher the risk of a fatal injury at higher speeds. The spread of speeds, and proportion of vehicles driving above the speed limit is also important.

However, based on the evidence available to date, this study has found no significant change in collisions and casualties, in the short term, in the majority of the case study areas (including the aggregated set of residential case studies). While some individual case study areas show a reduction in collisions / casualties when background trends are accounted for, these results are based on very small sample sizes and it is not possible to attach any confidence to their significance.

There is some evidence to suggest a positive 20mph impact in one case study location (Brighton Phase 1), where a blanket 20mph limit was introduced covering both major and minor roads, and where there is sufficient data to indicate a statistically significant change in collisions and casualties. It should be stressed that this represents just one case study, and the extent to which the findings are transferable to other locations is unclear.

The road safety data analysed for this study was based on between 17 and 42 months of data after the introduction of the 20mph limits, reflecting the different implementation dates for the various case study schemes. Further data is required to determine the long-term impact of the limits. Collision and casualty rates are known to fluctuate from year to year, and the post implementation data currently available may not be indicative of the longer-term trend.

Walking and cycling – Feedback from local residents and road users suggest that slower speeds are one of a combination of factors required to improve the environment for walking and cycling. In the case study areas, there continues to be a range of barriers which discourage walking and cycling. Time constraints, journey distance, and a general preference for driving remain important considerations. However, there are encouraging signs of a small (but significant) increase in use of active travel modes, based on self-reported evidence. In the case study areas, 5% of residents surveyed said that they are walking more and 2% said that they are cycling more since the introduction of the 20mph limits. Further changes may occur over time, as a result of the cumulative effect of other sustainable travel interventions or changes in individual circumstances.

Integration with other policy areas – This study has primarily focused on the impacts associated with introduction of a 20mph limit through signage and engagement activities only; and in the absence of any physical calming measures or changes to the landscaping or design of streets. It has not been possible, within the timescales of the study, to consider the longer-term role of 20mph limits as part of an integrated approach to address transport, community, environment and health objectives. In this context, the success of the Healthy Streets⁵² approach in London, which has been integrated into all aspects of Mayoral policy, will be of particular interest. This seeks to make London a greener, healthier and more attractive place through policy making and delivery at a street-level, network-level, and development-level. Slower speeds

⁵¹ Taylor et al. (2000), Finch et al. (2004), Elvik (2009), Richards (2010), Kröyer et al. (2014).

⁵² Healthy Streets for London: Prioritising walking, cycling and public transport to create a healthy city (TfL, Feb 2017)

are at the heart of the approach, creating streets which are more attractive for people to walk, cycle and spend time in.

12.4. Impact of new vehicle technologies

It is important to note that the impact of new vehicle technologies has not been considered in this evaluation study. The introduction of the following technologies could have a substantial impact on vehicle speeds (and compliance with speed limits), vehicle emissions and noise:

- Driver assistance or override systems (and autonomous vehicles in the longer term) are likely to lead to much stronger compliance with speed limits.
- Comprehensive Vehicle Tracking (linked to insurance premium) is also likely to encourage stronger compliance with speed limits.
- Further improvements in combustion engine technology and vehicle efficiency (vehicle weight, tyres, etc) and increased proportion of hybrid and electric vehicles in the fleet, leading to reduced vehicle emissions per mile and traffic noise. In July 2017, the Government announced plans to end the sale of all new conventional petrol and diesel cars and vans by 2040, as part of The UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations, produced by DEFRA and the Department for Transport⁵³.

12.5. Lessons and considerations for national decision-makers

National guidance – Based on the findings of this study, the guidance set out in DfT Circular 01/2013 remains broadly valid. This states that where there is expected to be a positive effect on road safety and a general favourable reception from local residents, traffic authorities should consider implementing area-wide 20mph limits on:

- major streets where there are, or could be significant numbers of journeys on foot, and/or where cycle movements are an important consideration, and this outweighs the disadvantage of longer journey times for motorised traffic; and
- residential streets where the streets are being used by people on foot and on bicycles, there is community support, and the characteristics of the street are suitable;

and, on the assumption that the limits are generally self-enforcing and that there should be no expectation on the police to provide additional enforcement beyond their routine activity, unless this has been explicitly agreed.

However, consideration should be given to encouraging traffic authorities to work with relevant partners from the police, health, environment, urban planning, education, and the local community to deliver 20mph limits as part of an integrated approach to addressing transport, community, environment and health objectives.

The guidance also needs to recognise the concern amongst the public regarding the apparent lack of enforcement, and the general view that the likelihood of being caught exceeding the limit is very small. Where a more proactive enforcement approach by the police is not practical, authorities should be encouraged to consider alternative approaches (e.g. community-based initiatives, use of vehicle activated signs, etc.), which may still require low level involvement of the police.

It is acknowledged that the current guidance is likely to lead to a mix of approaches across the country in terms of speed limits in built up areas, which creates a challenge in terms of embedding a culture of slower speeds in residential and pedestrian environments, and achieving driver compliance where 20mph limits are in place. There may therefore be broader reasons for strengthening the guidance whilst recognising that authorities retain the responsibility for setting speed limits on their roads.

National awareness campaigns – Changing how drivers think about driving in residential locations and areas of high pedestrian and cycle activity is crucial to the success of 20mph limits; and ensuring that compliance with the speed limit becomes the norm. Local authorities have a key role to play here and can engage directly with the local community. However, national publicity (for example, as part of DfT's *Think!*

⁵³ <https://www.gov.uk/government/news/plan-for-roadside-no2-concentrations-published> (Accessed 17/04/2018).

road safety speed campaign) could also help highlight the benefits of 20mph limits and reinforce messages about driving at an appropriate speed in residential areas.

Further analysis of safety outcomes – This study has found no significant safety outcome (in terms of collisions and casualties) in residential areas, based on the post implementation data available to date. Due to the small sample sizes and variability in the data, the statistical analysis undertaken to date indicates that the real change could be positive or negative. In addition, it has not been possible to draw any conclusions regarding the relative change in fatal injuries, cycle casualties, and casualties involving older people.

In the case of both the residential and city centre case studies, further data is required to determine the long-term impact of 20mph limits. Collision and casualty rates are known to fluctuate from year to year, and the post implementation data currently available may not be indicative of the longer-term trend.

It is therefore recommended that the safety analysis is updated once five years of data becomes available for each of the case study areas, i.e. once the 2020 STATS19 data has been published. This would be in line with standard evaluation good practice as undertaking a five year post-implementation evaluation is the standard approach for monitoring the impact of major transport schemes.

Further evidence on walking and cycling – This study has found a small (but significant) increase in walking and cycling activity. However, the results are based on self-reported perceptions of behaviour change and may not accurately reflect the real change in the frequency and amount of walking / cycling activity undertaken. In addition, there appears to be a lack of robust evidence from other studies to demonstrate the impact of 20mph limits on walking and cycling levels. Given the central role of walking and cycling in delivering health and environmental benefits, further evidence is needed regarding the strength of the relationship.

This will be a challenge as change in mode use is influenced by a range of factors and may occur over time rather than as a one-off decision. Long-term analysis of the relationship between walking and cycling activity nationally and the roll out of 20mph limits, may identify a relationship, but would need to take account of external and extraneous factors.

Is 20 plenty for health? Evaluation of the 20mph speed limit networks in Edinburgh and Belfast on a range of public health outcomes.

The NHS National Institute of Health Research has commissioned a major study into the health impacts of 20mph limits based on schemes in Edinburgh and Belfast. The study will run until 2020 and is intended to provide evidence on the impact of 20mph speed limits on safety and levels of physical activity, using surveys and before and after counts. The study is being undertaken by the University of Edinburgh and Sustrans.

Clarity on the role of 20mph limits and air quality – The relationship between speed and air quality is complex and influenced by a mix of factors including vehicle type, brake and tyre wear, variability and consistency of driving speed, traffic volume, and the nature of the road environment. Given the current focus on air quality and the need for action in many local authority areas to meet the requirements of the National Air Quality Plan and EU Air Quality Directive requirements, further clarity on the role that 20mph limit schemes could play would be beneficial.

National database of speed limits – One of the key challenges for this study was the lack of a definitive national database of speed limits identifying the location of all 20mph limits. This would provide the Department for Transport with a greater understanding of the coverage of 20mph limits, and would enable more detailed investigation of national trends and datasets. For example, the rate of collisions and casualties on 20mph limit roads (compared with high limits) at a national level, links between levels of walking and cycling activity (as monitored in the Active People Survey) and the roll out of 20mph limits nationally, the role of 20mph limits in Air Quality Management Areas, etc.

Speedmap

Speedmap is a long-term project with the aim of producing a network-independent national speed limit map for the UK. It has been developed in recognition of the need for an accurate map to support innovation in road safety – without being tied to a costly proprietary mapping solution.

12.6. Lessons and considerations for local decision-makers

Lessons and considerations for local decision-makers are set out in Section 2.6, covering the following themes:

- clarity around strategic case, objectives and outcomes;
- integration with complementary transport, health, environment and community policies and interventions;
- tailoring the scheme design to local circumstances;
- signage requirements;
- the importance of effective consultation and engagement;
- engagement with young drivers;
- appropriate skillsets;
- management of public expectations;
- revenue cost; and
- monitoring.



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