

Assessing the effectiveness of 30km/h speed limit in cities

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Abstract

Speeding is the number one cause of road crashes, especially in cities where pedestrians, cyclists and motorcyclists are highly exposed. This paper endeavours to assess the effectiveness of city-wide 30km/h speed limit. Towards that end, a thorough literature review was conducted and the changes in safety, emissions, energy, traffic, livability and health before and after the implementation of city-wide 30km/h speed limits were evaluated. To date, scientific evidence demonstrated that more than 40% lives saved with the introduction of 30km/h speed limits in urban areas; in parallel to significant positive environmental, energy and health impacts with less fuel consumption and more walking and cycling. Results from 40 different cities across Europe, such as Brussels, Paris and Zurich, indicated that reductions in speed limits improved road safety by decreasing the crash risk happening and the severity of crashes that do occur. On average, the implementation of 30km/h speed limit in European cities demonstrated a notable 23%, 37% and 38% reduction in road crashes, fatalities and injuries, respectively. Lower speed limits also yielded environmental benefits, with emissions decreasing on average by 18%, noise pollution levels by 2.5 dB, and fuel consumption by 11%, indicating enhanced fuel efficiency and reduced environmental impact. Encouraging citizens to embrace walking, cycling and utilizing public transit services can contribute to a safer and environmentally sustainable urban environment. Launching public awareness campaigns and encouraging the use of public transport and active mobility could be proved beneficial for the adoption of 30 km/h speed limits in cities.

Keywords: 30km/h; Speed Limit; Road Safety; Urban Areas; Implementation Modalities.

1. Introduction

Speed is fundamental to road safety, with many sources of evidence pointing to the profound role of speed in crashes, fatalities and injuries. Speeding not only makes a crash more likely to happen, but also increases the likelihood of severe injuries or death from a crash. Speeding encompasses excessive speed, which refers to driving above the speed limit, as well as inappropriate speed, which refers to driving too fast for the conditions, but within the limits. Evidence from a variety of sources, e.g. in-depth crash investigations, conviction data, and self-report surveys, indicates that male drivers and young drivers are more likely to speed. Findings reveal that male drivers under the age of 30 were over-represented in speed-related collisions, and this was particularly so for males aged under the age of 21.

Reducing speed limits in cities to appropriate levels, such as 30 km/h, offers benefits that extend beyond merely saving lives, preventing crashes, and reducing injuries among all road users. The enhancements in both actual and perceived safety and comfort for road users yield positive outcomes across various

societal well-being indicators, including safety, health, energy conservation, environmental preservation, accessibility, equality, and economic prosperity. Research and scientific evidence suggest that these benefits carry direct or indirect economic implications, often quantifiable (Lawrence et al., 2020).

Moreover, lower speeds can have a direct positive effect on the environment through the reduced direct and indirect emissions. More specifically, higher speed limits in urban environments are associated with harsh acceleration and deceleration (Omar et al., 2018). Calmer and slower driving can reduce carbon monoxide, volatile organic compounds and oxides of nitrogen emission rates by up to 17%, 22% and 48%, respectively, depending on the driver's aggressiveness and the gear engaged (Rakha et al., 2000).

The implementation of 30km/h speed limits in cities can yield broader public health benefits beyond just reducing fatalities and serious injuries. These encompass substantial advantages such as lower rates of obesity, and increased engagement in active transportation. According to Zijlema et al. (2018), using active transport modes improves mental health, while Warburton & Bredin (2016) pointed out that active transportation correlates with a reduced risk of over 25 chronic diseases and promotes longevity.

In recent decades, road designs have predominantly prioritized motorized traffic without adequately considering streets as public spaces or ensuring the safety of all road users. However, practitioners are now shifting away from the notion that there must always be a trade-off between safety and speed. Within the framework proposed by Corben (2020), known as "movement and place," both mobility and safety concerns can be addressed simultaneously, rather than treating them as conflicting priorities. By implementing speed limits that are tailored to the specific requirements of a road, considering its function as both a "place" and a pathway for "movement," communities can foster more vibrant and livable environments (VicRoads, 2019).

Enforcing safe speeds can enhance accessibility and consequently diminish the division caused by roads functioning as barriers within urban areas. In areas with high levels of motorized traffic and fast-moving vehicles, walking can be discouraged, and social interactions among residents living on opposite sides of the road can be limited. This severance can particularly impact communities in residential streets, where it could impede children from safely crossing roads to reach school or hinder workers from commuting safely between their residences and nearby workplaces.

Lowering speed limits is often met with resistance due to concerns about potential increases in travel times and traffic congestion. However, research generally indicates that any such impacts are negligible, and in some cases, reducing speed limits can even lead to improvements in travel times and congestion levels (Archer et al., 2008). Despite fears that lowering speed limits may result in slower travel, studies suggest that the benefits in terms of improved safety and other factors often outweigh any slight increases in travel times.

In many urban areas, it is important to recognize that average vehicle speeds often fall significantly below the posted speed limit due to congestion. Research has shown that in the top 25 most congested cities globally, actual vehicle speeds were well below 30 km/h (Pishue, 2021). Intersections, which are common in urban environments, often necessitate vehicle deceleration or stops, further reducing overall travel speeds. Interestingly, lowering the speed limit can sometimes lead to improvements in travel times by smoothing traffic flow and reducing bottlenecks. From an economic standpoint, optimal speeds are those that minimize costs related to safety, emissions, journey time, or other relevant factors.

The remainder of this paper is structured as follows: the theoretical background with the benefits of lowering speed limits in cities is given. At the next chapter, the methodology of this study is provided. This is followed by the cornerstone chapter of the paper covered by an extensive literature review implemented with respect to the effectiveness of city-wide 30 km/h speed limit measuring road safety, traffic efficiency, environmental impacts, etc. in several European cities. The results of the study are then presented, enabling the emergence of road safety-related conclusions.

2. Objectives

To date, several European cities, such as Brussels and Paris, are actively pursuing efforts to systematically increase the portion of their street networks governed by a 30 km/h speed limit, either across the entire city or within designated city regions. Many of these cities have adopted a broad implementation of a 30 km/h speed limit as a standard measure, designating it as the default unless otherwise sign-posted.

This study aims to critically assess the effectiveness of city-wide 30 km/h speed limit. To achieve this object, a thorough literature review was implemented and the benefits from 30 km/h speed limits in 40 cities across Europe were provided. This paper described the changes in safety, emissions, energy, traffic and livability, before and after the implementation of phased city-wide 30 km/h speed limits.

3. Methodology

The present study undertakes a comprehensive evaluation of the effectiveness of 30 km/h speed limit in cities. To achieve this objective, an extensive literature review was conducted, focusing on changes in various parameters such as safety, emissions, energy consumption, traffic patterns, livability, and public health before and after the implementation of phased city-wide 30 km/h speed limits.

To critically assess the effectiveness of implementing a 30 km/h speed limit in cities, a systematic search was conducted across scientific articles and grey literature sources using the key terms outlined in Table 1. The search process was executed across various databases, such as ScienceDirect, Scopus, ResearchGate, Google Scholar and PubMed.

Table 1: Search terms, screened and included papers

Key search	Review search terms	Screened papers	Included papers
30 km/h speed limit	"30 km/h" OR "20 mph" OR "30 km/h speed limit" OR "speed limit" OR "speed limit reduction" OR "maximum speed" OR "reduced speed" AND "traffic calming" AND "urban areas" AND "cities" AND "implementation modalities"	503	55

4. Effectiveness of 30km/h speed limit

4.1 Safety

To begin with, in September 2023, Wales in United Kingdom (UK), has instituted an urban speed limit of 30 km/h, reflecting a comprehensive effort to enhance road safety and improve the overall urban environment (Agilysis, 2023). This measure was designed to reduce crash risk, create safer streets for pedestrians and cyclists and promote a more sustainable and community-friendly approach to transportation. However, the effectiveness of the introduction of 30 km/h speed limit on road safety in

Wales has not been examined yet. Starting on 8 December 2023, Amsterdam reduced the speed limit on most of its roads (i.e. 80% of Amsterdam's roads) to 30 km/h (ETSC, 2023). With the new speed limit, it is expected to have a 20-30% reduction in serious crashes (Beek, 2022).

In January 2021, Brussels in Belgium, implemented a 30 km/h speed limit in urban areas. Under this implementation policy, the maximum speed is set at 30 km/h on all roads in the Brussels Capital region, except for major thoroughfares where the speed limit remains at 50 or 70 km/h. Despite being a new initiative for the city, significant improvements in road safety were observed. Five months after the introduction of the general 30 km/h speed limit, there was an overall 10% reduction in road crashes (i.e. dropping from 708 in the last quarter of 2020 to 635 in the first quarter of 2021). Specifically, during the first quarter of 2021, there were 635 road crashes compared to 814 during the same period in 2020 (i.e., the first quarter of 2020). Nevertheless, to mitigate any bias stemming from the coronavirus crisis lockdown, these figures were compared with those from the last quarter of 2020, which recorded 708 road crashes (The Brussels Times, 2021).

This decrease was also noticeable for serious injuries in Brussels, where a 37% reduction (i.e. from 38 in the final three months of last year to 30 in the first quarter of 2021) in serious injuries was identified (Moore, 2021). It is worth noting that the number of serious injuries was down from 46 in the first quarter of 2020 to 30 at the same period in 2021. One year later, a 20% reduction in serious injuries was observed, while fatalities also fell from 13 (2018) and 11 (2020) to 5 in 2021; an overall 55% reduction in the total number of fatalities in 2021 compared to 2020 was found (Leclercq, 2021). Nevertheless, it should be clearly mentioned that a significant part of this reduction (-55% in the number of fatalities) can be attributed to the introduction of the 30 km/h speed limits, but there are also other crucial parameters that might led to this decrease, such as COVID-19 pandemic. Interestingly, according to Moore (2021), the main reduction was found in crashes with vulnerable road users, such as pedestrians and cyclists.

Similarly, in August 2021, Paris in France, initiated the reduction of speed limits to 30 km/h on most city streets, taking concrete steps to enhance road safety and mitigate noise and air pollution. The implementation of this measure resulted in a 25% decrease in the number of bodily injuries and a 40% decrease in serious and fatal crashes (Polis, 2021). Findings from Munster in Germany, where 30 km/h speed limits were introduced in July 2021, revealed that one year after the implementation of the 30 km/h speed limit, there was a 72% decrease in the number of people severely injured in road crashes (Transport & Environment, 2021). In November 2021, Zurich in Switzerland, implemented 30 km/h speed limit restrictions on parts of its street network to reduce noise levels and improve residents' health and quality of life. Following the implementation of this measure, a 25% reduction in road fatalities was observed. Additionally, the incidence of car-pedestrian crashes was reduced by 16%, and the number of injured pedestrians decreased by 20% (European Environment Agency, 2022).

With the aim of encouraging the micromobility in the city of Bologna, Italy from July 2023 the speed limit dropped to 30 km/h. Two weeks after the implementation of this measure, road crashes have fallen by 21%. According to the City Council, compared to the same period in 2023, there were 25 fewer crashes and 14 fewer crashes with injuries and 27.3% fewer pedestrians involved (ANSA English, 2024). Moreover, in June 2018, Bilbao in Spain, reduced the speed limit to 30 km/h aiming to improve road safety, public health and quality of life for residents and reduce noise and air pollution. Two years later, in September 2020, 30km/h speed limits set for the entire city. Between 2019 and 2020, the city had reduced the number of road crashes by 28% (Eurocities, 2021). Overall, it is important to point the evidence from Spain, where the speed limit on the majority of roads was changed from 50 to 30km/h in

2019. After two years of implementation (2019-2021), Spain has reported a 20% reduction in urban road deaths, with fatalities reduced by 34% for cyclists, 31% for elderly and 24% for pedestrians.

In 2004, Helsinki in Finland, introduced widespread 30 km/h speed limit restrictions, which were later expanded in 2019. Initially implemented in the city center and certain residential areas, these speed restrictions were eventually extended to encompass almost all streets. Following the implementation of this measure, streets with lower speed limits experienced a 9% decrease in road crashes resulting in personal injury. Moreover, in areas where the speed limit was reduced from 40 to 30 km/h, a 19% decrease in pedestrian injuries and a 34% decrease in vehicle damages were observed. The most significant improvement occurred in the city center, where traffic-related injuries dropped by 42% (European Data Journalism Network, 2023). In 2019, coinciding with the citywide introduction of the 30 km/h speed limit, there were no pedestrian or cyclist fatalities in road crashes. Luxembourg has also expanded its 30 km/h zones to cover all built-up areas, mirroring Helsinki's initiative, where not a single pedestrian or cyclist was killed in a road crash in 2020 compared to 2021 (World Bank, 2021).

In general, close to 200 cities in France have introduced a 30km/h speed limit so far, including Grenoble, Nantes and Lille. More specifically, in 2016, Grenoble in France extended traffic to 30 km/h throughout the country. In 2016 and 2017, 43 of the 49 municipalities in the metropolitan area gradually joined this approach, with 30 km/h becoming the rule, making the metropolis the first major urban area to implement the generalisation of 30 km/h. There was a significant reduction in the number and severity of road crashes, with pedestrians in particular spared from crashes. An intriguing study found that the number of pedestrians killed or injured in Grenoble had decreased by 50% since the city implemented a 30 km/h speed limit (Radio France Internationale, 2021).

In addition, Lille in France was another city which has announced a 30 km/h speed limit from January 2021 aiming to improve road safety and make the city streets quieter to encourage more active modes of transport. On 19 August 2020, the council began dropping the city-wide speed limit from 50 to 30 km/h with the aim of turning 88% of Lille's roads into 30 zones, except for main roads. With only 44% of its roads having a 30 km/h speed limit back in October 2019, this was a major step and represented rapid progress. On August 2020, Nantes went into the 30 km/h speed limit in more than 80% of the urban roads, while one year later, Montpellier also started the implementation of 30 km/h zones. New signs have been installed at the entrances to the built-up area, identified by road markings, while zones remaining at 50 km/h were exceptions (Metropole Nantes, 2020).

In July 2016, Edinburgh in the UK reduced the speed limit on nearly all of its roads (e.g. city centre, main streets and residential roads) from 30 miles per hour (mph) to 20 mph (roughly 30km/h). One year after the extensive evaluation of 20mph speed limits, a 38% drop was observed, with 371 fewer crashes compared to the previous year. This decrease included fewer crashes involving cyclists and pedestrians (Vice, 2022). A breakdown of the casualty figures revealed that one year later, the number of fatalities dropped by 23% (i.e. 11 fewer fatalities compared to the previous year) while the number of serious injuries fell by 33% (Edinburgh News, 2022).

In addition, in June 2016, London in UK, has implemented 20 mph zones. The implementation of 20 mph zones resulted in an overall 46% decrease in death and serious injury crashes, with a 50% reduction specifically for children aged 0-15 inside the zones. Monitoring of the 20 mph schemes by Transport for London (2023) revealed significant reductions in collisions since the implementation of this measure. The number of collisions decreased by 25% (i.e. from 406 to 304), and collisions resulting in death or serious injuries also decreased by 25% (i.e. from 94 to 71), highlighting the substantial impact

of reducing speeds across London. Although vulnerable road users (VRUs) remained most at risk on London's roads, collisions involving VRUs decreased by 36% (i.e. from 453 to 290) since the introduction of 20 mph speed limits. Particularly encouragingly, collisions involving pedestrians decreased by 63%.

In Bristol, UK, the implementation of 20 mph zones has resulted in a 63% reduction in fatalities at the city level (Bornioli et al., 2020). Similarly, in Warrington, there was a reported 43% reduction in serious and slight pedestrian injuries compared to 18 months before the experimental period (Fisher & Tune, 2010). In Brighton and Hove, 20 mph limits were introduced in the city center in April 2013. In the first year of implementation, a significant 74% decrease in traffic speeds on the routes in the city center was observed, leading to 327 fewer casualties (-45%), including a negligible 1% reduction in fatal injuries, 11% decrease in serious injuries 33% drop in slight injuries (Brighton & Hove City Council, 2022).

In 1992, Graz in Austria was the first major European city which introduced a general 30 km/h speed limit in all city areas, aiming to improve road safety, air quality and reduce car-reliance. Nowadays, the 30 km/h speed limit applies to nearly 80% of the city's road network, encompassing all residential roads, school zones, and areas adjacent to hospitals. Already in the first two years of the policy, a 12% reduction in the number of road crashes was identified while 20% fewer persons were seriously injured after introducing the reduced speed limits from 50 to 30 km/h (Sammer, 1994). At the same time, road crashes involving pedestrians and motorists also decreased by 17% and 14%, respectively (ROSPA, 2017). As there were no other policy changes related to safe transportation during the same time period, the success was evidently attributed to the implementation of 30 km/h speed limits. Interestingly, the number of crashes began to rise again since 1996, but this was attributed to crashes occurring on higher-level roads where speed limit restrictions did not apply. In areas with 30 km/h limits, the total number of crashes remained constant or even slightly decreased.

Scotland's biggest city, Glasgow, introduced 30 km/h speed limits at the end of 2019 in order to create safer streets and make cycling and walking more appealing options for everyday transportation. In Glasgow, there are currently eighty-two 20 mph zones covering 288 km of roads, including the city center. Analysis of the police database revealed a total 31% reduction in the number of casualties within these zones since the implementation of this measure (Glasgow City Council, 2021). In Berlin, Germany the introduction of a 30 kph speed limit in 2017 has led to a drop in crash rates by around 10% from 2017 to 2020, based on the Federal Environment Agency (2021).

4.2 Emissions

As already implemented, Brussels in Belgium, established a citywide 30 km/h limit. Five months after the implementation of 30 km/h speed limit, there was a significant reduction in traffic noise by 2.5 db. The introduction of 30 km/h limits in Paris aimed to enhance air quality and mitigate noise pollution, resulting in a perceived noise reduction estimated at 50%. Additionally, noise pollution decreased by 3 dB following the implementation of these limits. Similarly, Zurich's decision to lower its speed limit was primarily driven by the goal of reducing noise pollution. After implementing this measure, traffic noise decreased by an average of 1.6 dB during the day and 1.7 dB at night (Brink et al., 2022).

The implementation of low-speed zones in various cities has led to notable reductions in noise levels. For example, in Buxtehude, Germany, there was a reduction of 7 dB (Sorrentino et al., 2015). Similarly, in Graz, Austria, noise levels decreased by 1-2 dB, while in Berlin, Germany, a reduction of 3 dB was observed (Sorrentino et al., 2015). In Modena, Italy, noise levels decreased by 3-5 dB (Campolieti &

Bertoni, 2009), and in Sweden, low-speed zones resulted in an average noise reduction of 3-4 dB, with a maximum reduction of 7 dB (Bendtsen et al., 2004).

In order to evaluate the impact of speed limit reduction from 50 to 30 km/h on noise and air pollutant emissions in Münster, Germany, research was conducted and data before and after the introduction of the speed limit were utilized (Müller-BBM, 2019). It was found that speed limits reduction led to a reduction in road traffic noise as well as the introduction of a 30 km/h speed limit had a positive effect on air pollution by nitrogen dioxide (NO₂). Edinburgh, UK, reduced the speed limit on nearly all of its roads from 30 mph to 20 mph. One year later, the areas with the reduced speed limit experienced a reduction in Particulate Matter (PM) by 8% (Nightingale et al., 2021). A similar pattern was identified in London in which an 8-10% decrease in PM was observed, after the introduction of 20 mph zones.

In January 2017, Berlin in Germany, applied 30 km/h speed limit to five main roads. After the implementation of this measure, significant improvements in air quality were observed. In particular, the level of nitrogen dioxide and monoxide emissions decreased by up to 29% from 2017 to 2020 in four out of the five cases (European Data Journalism Network, 2023). Furthermore, in June 2018, Bilbao, Spain, reduced the speed limit to 30 km/h aiming to reduce noise and air pollution. One year later, the city had reduced air pollution; a 11.4% decrease in NO₂-µm³, a 17.1% decrease in NO_x-µm³ and a 19.1% decrease in PM₁₀ was identified (Eurocities, 2020). Another important finding of the impact assessment in the city of Graz, Austria was that noise levels and NO_x emissions dropped by 2.5 dB and 25%, respectively, when maximum speeds of 30km/h were introduced (Sammer, 1994).

4.3 Energy

As already mentioned, in January 2021, Brussels in Belgium, set a 30 km/h limit in cities. Five months after introducing the general speed limit of 30 km/h, there was a significant reduction in fuel consumption by 10%. At the same time, one year after the implementation of the 30 km/h speed limit in Munster, a 12% reduction in fuel consumption was observed. The results align with expectations based on the general principles of traffic flow and vehicle efficiency at lower speeds.

4.4 Traffic

Reducing speed limits can prompt road users to choose alternative routes or modes of transportation, which, therefore, has a significant impact on traffic volumes. To begin with, in July 2016, Edinburgh in UK has adopted a 20 mph speed limit across all residential areas. Nightingale et al. (2021) investigated the impact of speed reduction on traffic volume in the City of Edinburgh. To achieve this object, traffic data collected before and 12 months after the phased implementation of city-wide 20 mph speed limits from 2016 to 2018 were analyzed. The implementation of the city-wide 20 mph speed limit intervention was correlated with a 2.4% reduction in traffic volumes on both main and residential streets. Additionally, the decrease in average speeds was consistent across different days of the week and times of the day, except during the night (01:00-06:00 am) when traffic volumes were relatively low, possibly due to higher average speeds during that time period.

It should be noted that in Brussels, Belgium, with the implementation of 30 km/h speed limits, no alteration in travel times was identified. Indeed, in some cases, there have been slight improvements thanks to greater traffic fluidity (Bologna30, 2022). In a survey conducted in Bilbao, responders who were initially most resistant to the measures, such as traders, delivery drivers and taxi drivers proved to be happy to improve traffic flow and acknowledge that the lower speed limit did not cause them any

problems (City30.brussels, 2022). At the same time, with the introduction of the generalized limit throughout the city to 30 km/h, a slight 2% decrease in traffic in Bilbao was also observed. With the introduction of 30 km/h speed limits in Zurich, travel times had lengthened by between 10" and 30" seconds per kilometre, a small gap that almost disappeared during rush hour (Bologna30, 2022).

At the same time, in Grenoble, France, there was a significant reduction in motorised traffic in the city between 2016 and 2018. In particular, there were 9% fewer light vehicles and 20% fewer heavy vehicles after the introduction of 30 km/h speed limits in urban and rural communes in Grenoble's metropolitan area (City30.brussels, 2022).

4.5 Livability

Traveling by car can be discouraged due to the increase in travel time, as a result of lower speed limits. According to Elvik (2018), traveling by bicycle and foot was more attractive due to the declined crash risks which were also detected in Brussels after the speed limit reduction (Moore, 2021). In addition, Copenhagen in Denmark has imposed 30km/h in the city centre from June 2022 in order to encourage public transport use and reduce CO₂ emissions (CPH post, 2023).

After the introduction of 30 km/h speed limit in Zurich, Switzerland, pedestrians and cyclists were found to be the most satisfied. In addition, many of the interviewees felt that the roads were safer and less noisy (City30.brussels, 2022). One of the ultimate goals of speed limit reduction from 50 to 30 km/h in Graz, Austria was to reduce reliance on cars and simultaneously encourage cycling. Results indicated that more than 16% of journeys were done by bike. Interestingly, a survey conducted in July 1992 showed that only 30% of residents were in favour of 30 km/h speed limits before they were introduced, while only 8 months later, the satisfaction rate already stood at 52%, reaching 81% in 2002.

Reducing speed limits not only enhances road safety but also facilitates better utilization of public space, promoting soft and active mobility while providing opportunities to reimagine urban areas. By lowering the speed limit from 50 to 30 km/h, an average of 20 to 50 cm of roadway is freed up, which can be repurposed for various uses such as extending sidewalks, introducing greenery, and creating cycle paths to encourage multimodality and active travel across the French capital. Similarly, Lille became the first city in France with over 500,000 inhabitants to gradually lower its speed limit to 30 km/h almost everywhere, aiming to prioritize pedestrians and reduce the dominance of cars. The main benefit was a significant 55% increase in the number of cyclists compared to 2016 figures (City30.brussels, 2022). After three years of implementation of 30 km/h speed limits, in Grenoble, France, active users approved the proposed approach and cyclists' feelings have improved over the duration of the evaluation: 61% of pedestrians and 70% of cyclists are in favour of the new regulations (Cerema, 2020).

4.6 Health

With the introduction of 30 km/h speed limits in Bilbao, findings revealed that there were less stressed citizens, with fewer health problems, and therefore, a quieter city was promoted. Cycling trips went almost six times as much; from 320,000 in 2018 (before the introduction of the measure) to 1,791,000 in 2022 (Bologna30, 2022).

5. Discussion

Setting a speed limit of 30 km/h in areas where people and traffic mix can lead to safer, healthier, greener, and more livable streets. The reduction in speed limits aims to improve road safety by lowering

traveling speeds, thereby reducing the risk and severity of crashes. Additionally, the introduction of 30 km/h speed limits can decrease congestion, improve traffic flow, and reduce travel times by minimizing stop/start traffic movements. Calmer driving at lower speeds promotes healthier living for drivers and all road users. Furthermore, implementing 30 km/h speed limits can significantly reduce fuel consumption and emissions. Smoother traffic flow leads to additional fuel economy, while streets that prioritize safe walking and cycling can reduce car dependency and harmful vehicle emissions that contribute to climate change. The introduction of 30 km/h speed limits plays a crucial role in reducing air pollution by decreasing carbon dioxide and nitrous oxide emissions from diesel cars, as well as particulate matter emissions from both diesel and petrol cars.

The maximum and average values of the quantitative effect of city-wide 30km/h speed limit in terms of safety (i.e. crashes, fatalities, injuries), emissions, fuel consumption and traffic congestion are presented in Table 2. Notably, there was a significant decrease in crashes, with an average reduction of 23%, and a maximum reduction of 46%. This reduction in crashes translates to a safer urban environment, as evidenced by the corresponding decrease in fatalities and injuries by averages of 37% and 38%, respectively, with even more substantial reductions in certain instances. Additionally, the implementation of lower speed limits resulted in tangible environmental benefits, including an average decrease of 18% in emissions and reductions in noise pollution levels by an average of 2.5 dB. Furthermore, fuel consumption decreased by an average of 11%, indicating improved fuel efficiency and reduced environmental impact. Moreover, the reduction of speed limits in urban areas contributed to the alleviation of traffic congestion, with an average reduction of 4%.

Table 2: Maximum and average values of the quantitative effect of city-wide 30km/h speed limits

	Average	Max
Crashes	-23%	-46%
Fatalities	-37%	-63%
Injuries	-38%	-72%
Emissions	-18%	-29%
Noise	-2.5 dB	-3 dB
Fuel consumption	-11%	-12%
Traffic congestion	-4%	-9%

The study encountered several limitations that warrant acknowledgment. Firstly, there was a lack of data to quantitatively assess the effects of speed limit reductions on livability and public health. Given that many of these cities have only recently implemented the speed limit reductions, the impact of the introduction of 30 km/h limits in several cities has not yet been thoroughly examined. Secondly, it is worth highlighting that due to the COVID-19 pandemic, 2020 was not a typical year in terms of mobility and road safety. The COVID-19 pandemic had a significant impact on traffic and road safety, with a significant reduction in road fatalities per million population following the introduction of lockdowns measures. Moreover, another limitation of the present collision meta-analysis was that only several months and one or two-year worth of post-implementation data were utilized. Even though the key findings and the outcomes were promising and encouraging, the analysis should be interpreted as preliminary until additional years' data become available in order to guarantee a more definitive and thorough evaluation. Thus, additional data collection and evaluation are needed in order to assess these potential effects. The long-term effects of posted speed limit reduction could not be further determined.

Overall, the study demonstrated that the implementation of the new speed limit had a positive impact on road safety, as evidenced by significant reductions in speeds and collisions. However, there were areas where drivers did not comply with the speed limit, indicating the necessity for further intervention. The findings underscored the importance of reducing speed limits to enhance road safety and emphasized the ongoing need for monitoring and evaluation of road conditions to inform decision-making effectively. It is important to gather documentation from additional cities that have adopted similar measures, including smaller towns and cities where such speed limits have been in effect for an extended period. Future research should also examine the long-term impact of the effectiveness of city-wide 30 km/h speed limit, as the comparison period before and after the implementation of 30 km/h speed limits was not the same. In the future, the quantitative effect of this measure for more and more cities should be included in the analysis. Finally, the exact effect of 30 km/h speed limits on mental and physical health should be taken into consideration.

6. Conclusions

Speeding stands as the primary cause of road crashes globally, particularly within urban settings where pedestrians, cyclists, and motorcyclists face heightened exposure and vulnerability in the event of a collision. To mitigate this risk, road environments are being designed to reduce vehicle speeds to 30 km/h or lower. This goal is accomplished through the establishment of 30 km/h posted speed limits, bolstered by measures such as speed enforcement, traffic calming strategies, and the provision of pedestrian facilities. These efforts aim to safeguard the well-being of pedestrians, cyclists, and motorcyclists. Concurrently, the adoption of 30 km/h speed limits is gaining momentum, serving as inspiration for other communities and being progressively implemented in a growing number of cities.

This research paper used an observational study aiming to critically assess the effectiveness of city-wide 30 km/h speed limit in Europe. To fulfil this object, a thorough literature review was conducted and the benefits from 30 km/h speed limits in 40 cities across Europe were highlighted. The work involved a comprehensive speed, collision, emissions, energy, traffic, livability and health assessment of the roads before and after implementing the new speed limit.

The results highlight the multifaceted advantages of lower speed limits, not only in enhancing road safety but also in promoting environmental sustainability and improving overall urban livability. As such, policymakers and urban planners should consider the implementation of reduced speed limits as a comprehensive strategy for creating safer, healthier, and more efficient urban environments.

The discussion and introduction of 30 km/h speed limits often encounter strong opposition and entrenched resistance, while the voices of supporters tend to be relatively muted and ineffective. Consequently, politicians and Authorities may exhibit hesitancy in implementing such measures. Thus, the implementation of a city-wide 30 km/h speed limit requires careful planning and consideration of various modalities. Establishing a legal framework is crucial for implementing a city-wide speed limit. This involves reviewing and updating existing traffic laws and regulations to reflect the new speed limit requirements. Coordination with local transportation departments, city councils and law enforcement agencies is also required.

In order to successfully implement 30 km/h speed limits in cities, it is essential to launch public awareness campaigns that emphasize the safety benefits associated with the reduced speed limit and to elucidate the rationale behind its implementation, with the overarching goal of gaining public support. Efforts should extend beyond citizens to include politicians, fostering a collective understanding and

endorsement of large-scale interventions for improved road safety. This comprehensive approach involves the launch of public awareness initiatives through diverse channels, including media campaigns, informational brochures, and community outreach programs. By employing a multifaceted communication strategy, these campaigns aim not only to inform but also to actively engage and unite society in advocating for the adoption of a 30 km/h speed limit, creating safer and more sustainable urban environments. Simultaneously, promoting Public Transport and active mobility options is crucial for reducing reliance on private vehicles. Encouraging citizens to embrace walking, cycling, and utilizing public transit services can contribute to a safer and more sustainable urban environment.

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