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# Who owns the roads? How motorised traffic discourages walking and bicycling

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## See Commentary, p 362

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## ABSTRACT

**Objective:** To examine the impact of traffic on levels of walking and bicycling.

**Method:** Review of the literature of medical, public health, city planning, public administration and traffic engineering.

**Results:** The real and perceived danger and discomfort imposed by traffic discourage walking and bicycling. Accurately or not, pedestrians and bicyclists judge injury risk and respond accordingly. Although it can be difficult to measure these effects, observed behaviour provides good evidence for these effects, with the strongest association being an inverse correlation between volumes and speeds of traffic and levels of walking and cycling.

**Conclusion:** Interventions to reduce traffic speed and volume are likely to promote walking and bicycling and thus result in public health gains.

Over the past two decades, the health consequences of physical inactivity have become increasingly apparent. Non-communicable diseases and related conditions, such as overweight and obesity, have increased steadily in Europe and the USA. European health ministries have acknowledged that physical inactivity, along with unhealthy diets, plays a key role in the obesity epidemic, and poses one of the most serious challenges to public health in Europe. Many have endorsed the promotion of physical activity, including stimulating cycling and walking, by better urban design and transport policies.<sup>1</sup>

During the mid-1990s, an international scientific consensus developed over the value of moderate physical activity—at least 30 min of physical activity on most, preferably all, days of the week for adults—in reducing risks of a number of non-communicable diseases.<sup>2</sup> Children and young people should participate in physical activity of at least moderate intensity for 60 min per day. At a frequency of at least twice a week, some of these activities should help to enhance and maintain muscular strength, flexibility and bone health.<sup>3,4</sup> However, an analysis of a survey of European Union countries showed that two-thirds of the adult population did not reach recommended levels of physical activity, and another survey showed similar results among young people aged 11, 13 and 15 across Europe.<sup>5,6</sup>

Integrating physical activity into daily life is an important factor in increasing population levels of activity; bicycling and walking are major potential contributors to this.<sup>7,8</sup> Many journeys are short, yet many of them are taken using cars. It has been estimated that some 50% of these short trips could

be walked or bicycled easily, thereby providing the recommended amount of daily physical activity.<sup>7-9</sup>

In addition, switching from driving to walking and cycling is important for reducing CO<sub>2</sub> emissions.<sup>10</sup> For example, it has been estimated that, if the US population aged 10–64 bicycled for 60 min a day and therefore reduced their car use by that distance bicycled, it could reduce US CO<sub>2</sub> emissions by almost 11%.<sup>11</sup>

How people perceive traffic is an important but poorly understood determinant of travel choices and consequent levels of physical activity through cycling and walking. In 2000, a report by the World Health Organization (WHO) noted that the impact of motorised traffic on people walking and bicycling remained unquantified, but speculated that it might be the greatest health impact of motorised traffic.<sup>12</sup> This paper describes these links and identifies possible entry points for corrective interventions and areas for further study.

Five recent review articles examine some reasons why people do not walk or bicycle. These articles examine attitudes towards walking and bicycling,<sup>13</sup> the relationship between the way neighbourhoods are built and the amount of walking and bicycling,<sup>14</sup> and what interventions encourage people to walk and bicycle.<sup>15-17</sup> However, there is important additional evidence that needs to be considered, which is that people actually avoid walking and bicycling near traffic.

## METHOD

We searched for papers that reported observed evidence that traffic discouraged walking and cycling in medical, public health, city planning, public administration and traffic engineering literature. This is an inchoate and poorly organised area of research, with very few publications identified through formal literature review, so the majority of the papers were identified through our professional networks. In these publications and reports, specific evidence relating to the question was often only presented incidentally.

## RESULTS

Our literature search found that negative traffic perceptions are associated with decreases in walking and bicycling. This finding was consistently found across several types of studies.

A number of studies have observed people avoiding dangerous and unpleasant traffic. Where pedestrians and bicyclists are safer, levels of walking and cycling tend to be higher, and vice versa. Figure 1 shows the relationship between the safety of cycling and the amount of cycling in 14

European countries; this relationship is observed consistently across a wide range of contexts.<sup>18</sup>

Traffic can delay, and hence deter, walking and bicycling. Traffic also imposes injury risk on non-motorised travellers. In Sweden and Denmark, roadway investment planning incorporate methods for quantifying this barrier effect.<sup>19</sup>

Fear of traffic can be seen in how and where pedestrians cross streets. In the USA, 14% of the people on crosswalks ran rather than walked across the road.<sup>20</sup> Pedestrians are less likely to cross streets if the crosswalk is unmarked. Where legs of an intersection were otherwise matched and comparable, but only one of the crosswalks was marked with paint, pedestrians avoided the unmarked crosswalk in a 2/1 ratio. Young and older pedestrians were even more likely to avoid the unmarked crosswalk, more so as the number of traffic lanes increased.<sup>21</sup>

Even though motorists are legally obligated to yield at zebra crossings, three out of four motorists use speed to intimidate pedestrians into yielding. Only 5% of the motorists yield to pedestrians.<sup>22</sup>

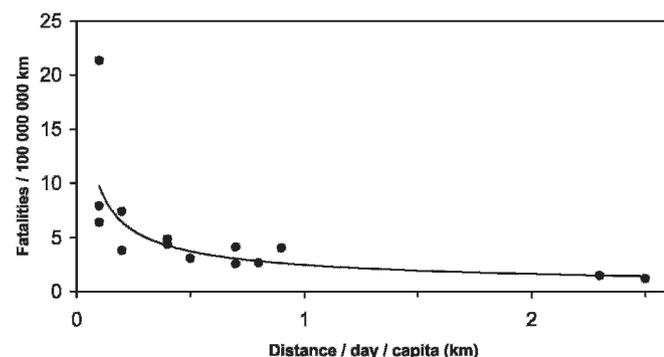
When roadways are equipped with sidewalks, nearly four times as many people walk. More than six times as many people walk along two-lane roads as four-lane roads.<sup>23</sup>

Men and women bicycle at different levels, possibly reflecting different attitudes to risk. In communities with low levels of cycling, more men than women bicycle, but, as the number of bicyclists increases, the sex differences diminish.<sup>24</sup>

Neighbours are less likely to know and trust each other in neighbourhoods with high traffic volume. Outdoor activities are less common on high-traffic streets. Children are rarely found playing except on the light-traffic streets. Residents felt their delay in crossing streets increased as traffic volume increased. The author of this study concluded that the “impacts of traffic on street life were extremely severe.”<sup>25</sup>

The amount of walking and bicycling changes with both long-term and short-term changes in traffic volume and speed. Over two generations, the amount of walking and bicycling has greatly decreased in many countries, with far fewer children playing in the streets.<sup>26</sup> Before automobiles dominated the streets, children played in them.<sup>27</sup> In the early 1900s, the advent of motor vehicles was seen as gradually driving bicyclists from the roads because of the dangerous and unpleasant nature of motor vehicle use.<sup>28</sup>

In the long term, traffic volume and speed have increased. In the USA, traffic volume increased 63% between 1980 and 1997, almost three times faster than population growth.<sup>29</sup> In Western European countries, car use is now 2.5 times that of 1970.<sup>30</sup>



**Figure 1** Fatalities/100 million km cycled as a function of distances travelled/day/capita in 14 European countries.<sup>17</sup>

Eastern European traffic has grown tremendously, but it is poorly documented.

In 1971 and again in 1990, children and parents from the same five neighbourhoods in England were asked about their freedom to travel. Despite essentially physically unchanged neighbourhoods, the surveys show that “whilst 80% of 7 and 8 year olds went to school on their own in the early 1970s, less than 10% were doing so two decades later.”<sup>32</sup>

This neighbourhood survey is matched by other, broader surveys. In a recent 10-year period in the UK, children’s school trips on-foot and on-bike have decreased by 10 percentage points.<sup>31</sup> In the USA, 48% of students walked or bicycled to school in 1969. Today, fewer than 15% of children walk to school and only 1% bicycle.<sup>32</sup> In the USA, half of this change is due to greater travel distances.<sup>33</sup> However, for children who live within a mile of school, the share of children walking or bicycling to school also dropped precipitously, from close to 90% in 1969 to 31% 30 years later.<sup>32</sup>

The rapid motorisation in developing countries has been accompanied by an even faster decline in bicycle riding. A survey in China found that 43% of bicyclists have reduced bicycling—and only 11% said it was because they had bought a car. The main reason was the perceived increased danger in the streets.<sup>34</sup> In many African cities, bicycle use was common and significant 20 or 30 years ago. For example, in Lusaka, Zambia, the share of commute trips by bike was 55% in 1969. Now bicycle use has become insignificant in the largest cities because of the increasingly hostile and unsafe environment created by motor vehicle traffic.<sup>35</sup> In contrast, Bogotá increased the use of bicycles from less than 1% to 4% in 3 years by constructing 250 km of bicycle facilities and by promoting bicycle use, including by closing many streets to motorised traffic on Sundays.<sup>10</sup>

Interventions that reduce the danger of traffic to people walking and bicycling, such as traffic calming, constructing trails, closing or restricting use of roads, road user charging, constructing bicycle infrastructure and implementing safe routes to school programs, encourage walking and bicycling.<sup>15–17</sup>

## DISCUSSION

The real or perceived danger and unpleasantness of traffic discourages walking and bicycling. There is both survey and observational evidence for this and a strong association between increasing speeds and volumes of traffic and decreasing levels of walking and cycling.

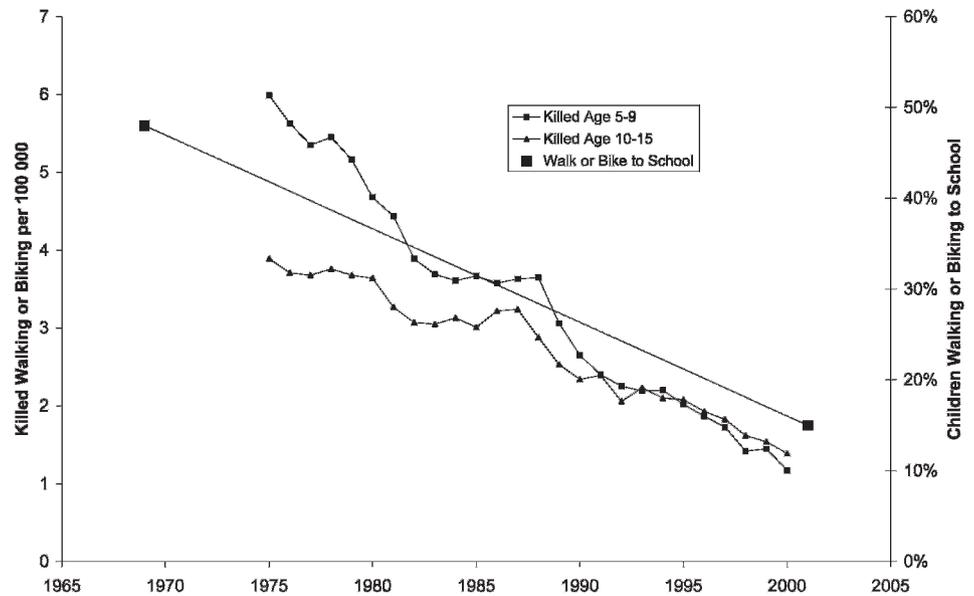
### Methodological strengths and weaknesses of the study

In most urban areas around the world it is difficult to find locales where traffic danger is not a continuing reality of everyday life—traffic and traffic danger are almost ubiquitous—yet have rarely been studied as a causal component of people’s physical inactivity.

Given its ubiquity, it is hard to isolate the role of traffic from other factors influencing active travel behaviour. Indeed, many people, including researchers, are so accustomed to exposure to traffic that they may find it hard to conceive of a world without it; the influence of traffic on walking and cycling remains largely unresearched.

This omission also extends to interpreting injury statistics. In 1999, the US Centers for Disease Control and Prevention celebrated the 41% decrease in number of pedestrians killed over a 22-year period,<sup>36</sup> but they apparently did not consider the importance of the amount of walking. For young children, their

**Figure 2** School age children in USA: safer streets or less walking and bicycling?



70% decrease in fatalities matches their 67% decrease in walking to school (fig 2),<sup>32, 37</sup> while among middle-aged pedestrians, the decrease in their fatality rate (10%) was less than their decrease in walking (30% decrease in walk-to-work rate).<sup>37, 38</sup> So the decline in injuries may reflect to a significant extent lower levels of exposure to danger among the population, rather than any true reduction in road danger. This has also been observed in the UK.<sup>39</sup>

It is also important to note that improved medical care has increased the likelihood of survival in the event of a motor vehicle crash.<sup>40</sup> For these two reasons, fatality statistics, in isolation from other information, are an inadequate measure of the traffic danger faced by people walking and bicycling.

Traffic can also discourage physical activity by making walking and bicycling unpleasant. Streets in new neighbourhoods are often designed primarily around the needs of motorists and are thus unattractive for pedestrians. Many newer neighbourhoods separate land uses and devote more



**Figure 3** British injury prevention campaign.



**Figure 4** US injury prevention campaign.

## Original article

## What is already known on the subject

- ▶ People do not walk and bicycle for a variety of reasons.
- ▶ Most of the research on barriers to cycling and walking to date focuses on attitudes and the built environment.

## What this study adds

- ▶ Traffic, because it is dangerous and unpleasant, discourages walking and bicycling.
- ▶ Increasing traffic volume or speed discourages walking and bicycling and therefore harms health.

space to parking and roads than to the needs of pedestrians and cyclists. They thus have greater distances between destinations, which discourages walking and bicycling.<sup>41</sup> Many communities built before motor vehicles have yielded public spaces to parking, and their roads have filled with traffic.

The evidence on the relationship between perceptions of the traffic environment and walking and cycling is consistent in showing an inverse association between traffic danger (or perceived danger) and levels of walking and cycling. However, the majority of the evidence is observational, and is confounded by hard-to-isolate issues such as cultural attitudes to driving and perceptions of convenience.<sup>13</sup> This review is not systematic, and thus may suffer from biases and oversights. Although this does not diminish the significance of the identified effects, it highlights the need for well-structured research to address these important public health issues.

## Results in relation to other studies

The evidence on determinants of walking and cycling describes a wide range of factors, from environmental to personal.<sup>13 14 41–43</sup> Much of this research has focused on the built environment, which is relatively easy to measure. Some neighbourhoods deter walking and bicycling by segregating land use, low residential density and infrequent street intersections.<sup>14 41 42</sup>

Perceptions of risk of being injured by motorised traffic affect decisions to drive, walk, bicycle or use public transport.<sup>44</sup> Perceptions differ from true risk because of cultural influences and the individual characteristics of the people experiencing the fear.<sup>44</sup> Fear may suppress walking and bicycling in several ways. Fear of crime is known to discourage physical activity.<sup>38</sup> Air pollution and vehicular exhaust and noise probably discourage walking and bicycling. In addition, neighbourhood conditions such as poor walking surfaces and loose dogs reduce walking and bicycling.<sup>38</sup>

## Meaning of the results for policy

Changing land use and reshaping population density take a long time and have high costs. On the other hand, traffic can be made less dangerous and more pleasant relatively quickly and inexpensively—for example, through traffic calming, 30 km/h zones, congestion charging, providing cycle tracks on major streets, and giving priority to the rights and safety of vulnerable road users as opposed to motorised transport. This provides an important opportunity to develop a health-improving environment that supports physical activity and contributes to

## Policy implications

- ▶ Compared with rebuilding streets and neighbourhoods, traffic can be made less dangerous and more pleasant quickly and relatively inexpensively—for example, through traffic calming interventions, congestion charging, enforcement of speed limits and prioritisation of the rights of pedestrians and cyclists over motorised traffic.
- ▶ Society can encourage physical activity and counteract non-communicable diseases and obesity by making traffic less dangerous and more pleasant.

reductions in risks for non-communicable diseases, obesity and related health problems.

Cooperation and coordination is needed between health promotion efforts to reduce injuries and increase walking and bicycling.

The British injury prevention campaign of the early 1990s, “One False Move and You’re Dead” (fig 3) was criticised for using fear,<sup>26</sup> which, as shown, discourages walking and bicycling. Nonetheless, many injury prevention efforts continue to use fear. Figure 4 shows an injury prevention campaign poster produced by the US Government in 2007, which uses the outline of a corpse to remind people that motorists can kill them while they walk in their own neighbourhoods.<sup>45</sup>

Society has often placed the responsibility for preventing injuries on the person walking or bicycling. Soon after the automobile’s creation, its proponents worked to reconstruct the meaning of safety, removing the connection between speed and danger. Car proponents crafted “safety” campaigns that placed the burden for preventing injury on the person walking, generating the term “jaywalker” for the person who failed to show deference to the motorist by walking where and how they always had. Car proponents had the major control in writing traffic laws and developing traffic engineering policies, and these favour the motorist over other road users.<sup>27</sup> Pedestrians—even children—are often blamed for their injuries.<sup>46</sup> Injury prevention research often reflects this perspective. For example, a study of seriously injured bicyclists found that motor vehicle involvement was overwhelmingly the greatest risk factor.<sup>47</sup> However, the authors considered helmets, separation of cyclists from motor vehicles and delaying cycling until children are developmentally ready as part of the recommendations to prevent injuries, which contribute to reinforcing the fear of cycling, and did not consider effective measures such as lowering traffic speeds to make roads safer for bicyclists. Society often still terms traffic crashes “accidents”, a term that excuses the perpetrator, diminishes the concerns of the victim, and perpetuates the myth of inevitability.<sup>48</sup> Although motorists with a history of traffic citations are known to be at increased risk of colliding with child pedestrians, society allows them to continue to drive, implicitly valuing their mobility above the safety of others.<sup>49</sup>

## Unanswered questions and future research

The role of fear-based road safety efforts in reducing physical activity, and hence health, deserves further investigation. It seems likely that traffic safety efforts that evoke fear in the potential victims discourage walking and cycling. If fewer people walk or bicycle, then each remaining walker or bicyclist is in greater danger.<sup>18</sup>

Given that many roadway projects make traffic more dangerous and less pleasant, the effects on people walking and bicycling should be routinely measured. Routine monitoring of walking and bicycling would address this, and allow identification of positive as well as negative effects of transport interventions.

The health benefits of increased physical activity resulting from changes in walking and cycling should be quantified and included in appraisals of transport projects. This approach can be used for schemes such as the London congestion charge as well as engineering and infrastructure projects.<sup>50</sup> Tools such as the WHO health economic assessment tool for cycling<sup>51</sup> provide a powerful mechanism for doing this.

The evidence presented here shows that reducing traffic speed and volume encourages walking and bicycling. A shift in focus away from prioritisation of motorised mobility to a wider consideration of transport impacts, including the indirect impacts of traffic danger on physical activity, is an important step in moving towards a healthier, more active, and less obese society.

**Competing interests:** None.

We presented this paper, in an earlier form, at the 15 May 2006 WHO European Environment and Health Committee, Oslo.

**Provenance and peer review:** Not commissioned; externally peer reviewed.

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