

Summary:

Making Vision Zero real: Preventing pedestrian accidents and making them less severe

This report describes how the risk of pedestrian and cyclist accidents has developed over time, factors affecting the risk, and measures to reduce the probability and severity of pedestrian accidents. Accident patterns are found by analysing Norwegian accident statistics and through literature review.

Pedestrians and cyclists have higher risk than motorised road users

The risk of fatal accidents among pedestrians and cyclists is about the same in Norway as in the other Nordic countries, and lower than in other European countries. Fatality risk has been decreasing over the last 20 years. It is on average ca. 10 times as large as the fatality risk per million person-km of travel by car. The case fatality rate (the proportion of all those injured who are killed), is greater for pedestrians than for cyclists, except when cyclists collide with pedestrian and in single bicycle accidents, where the risk is greater for cyclists. Estimations of fatality or injury risk for pedestrians and cyclists are more uncertain than for motor vehicles. The level of accident reporting for non-motorized road users is lower in Norway than in most other European countries.

Accident patterns are related to exposure

- Among pedestrians the highest risk to be seriously injured is found among those above 64 years. Among cyclists the highest risk is found among those below 15 years.
- The proportion of fatal or severe injuries among pedestrians and cyclists where there is suspicion of the presence of alcohol or drugs seems to be quite constant over time. It is greater among pedestrians than among cyclists.
- The total numbers of severe injuries is constant Monday through Friday and somewhat lower in weekends.
- The largest numbers of pedestrian and cyclist accidents occur at higher temperatures when more people use these transport modes. Whether or not injury severity is different at different temperatures is not clear.

Accident patterns with respect to road and traffic conditions

- Injuries for pedestrians and cyclists are more severe at higher speed limits.
- Accidents in non-urban areas are more severe than accidents in urban areas.
- Road conditions (holes in the asphalt, slippery roads, high curbs etc.) contribute to accidents of pedestrians and cyclists.
- The number of severe accidents is greater on dry roads than on wet roads, especially among cyclists, probably due to the greater amount of cycling. This difference can not be found for fatal accidents.
- The number of severe pedestrian accidents is greater in daylight than in the dark, but the difference between daylight and dark is smaller than for other groups.
- The risk of cyclist accidents is lower when cyclists and cycling lanes are made visible in the traffic environment.

Accident patterns with respect to collision type

- Most fatal injuries to pedestrians and cyclists occur in collisions with motor vehicles, mostly cars. Collisions with trucks are far more fatal than collisions with other motor vehicles. Collisions with cyclists are less often fatal than other collisions.
- In most collisions between a pedestrian or cyclist and a motor vehicle, the pedestrian / cyclist is hit by the front of the motor vehicle. The injuries are least severe when the pedestrian / cyclist is hit by the rear of a motor vehicle.
- The most severe head injuries are sustained when being rolled over by a motor vehicle.

Accident patterns with respect to safety equipment

- The injury risk is higher for pedestrians not wearing reflective materials than for pedestrians doing so.
- The risk of severe injuries in an accident is slightly greater for cyclists wearing a helmet than for cyclists not wearing a helmet.
- In collisions with cars the most severe injuries are caused by the bumper, followed by the engine bonnet and the windscreen.
- The a-pillar, the roof and other parts of the car are only occasionally causing injuries. If a pedestrian is thrown through the air by the car, the throwing range depends on the stiffness and speed of the car.

Several measures can reduce risk

Measures that have been found to reduce pedestrian or cyclist accidents are:

- Speed reduction for motor vehicles on roads used by motorized and non-motorized road users reduces the probability and severity of pedestrian and cyclist accidents. This can be achieved by reductions of speed limits, speed enforcement, or physical measures or separating high-speed motor vehicle traffic from pedestrian and cyclist traffic.

- An active safety vehicle measure that can reduce the probability and severity of collisions between motor vehicles and pedestrians by reducing the speed of the vehicle before the collision is brake assistant systems (BAS).
- Safe crossing facilities for pedestrians (grade separated facilities; bridge, tunnel), signalized pedestrian crossings, a refuge (median) in pedestrian crossings or raised pedestrian crossings reduce accident risk for pedestrians.
- Visualisation of pedestrians and cyclists paths /lanes in the traffic environment.
- Winter maintenance that reduces the slipperiness of the roads will reduce the numbers of falling accidents and the numbers of collisions with motor vehicles. The most effective method is warming up of sidewalks.
- Visibility aids for pedestrians and cyclists reduce the probability and severity of pedestrian and cyclist accidents. Visibility aids are most effective when they improve both detection and recognition.
- Bicycle helmets may reduce the severity of accident consequences by preventing or reducing the severity of head, brain, and face injuries. The size of the effect is highly controversial, especially for adults. Mandatory use of cycle helmets may reduce the amount of cycling.
- Passive vehicle safety measures can reduce the severity of pedestrian and cyclist injuries, i.e. by increasing the deformability of the vehicle front: bumper, engine bonnet, windscreen, and a-pillar. The form and height of front protection systems are also relevant, especially for injuries among children.

Measures that have not been found to significantly reduce pedestrian and cyclist accidents are different crossing facilities for cyclists (marked bicycle lanes and advanced stop line for cyclists in signalised junctions) marked crosswalks for pedestrians (curbed central islands at intersections can provoke more pedestrian crossings on roads where pedestrians otherwise would not cross). Other measures of the kind are sidewalks and cycle paths that do not always reduce pedestrian and cyclist accidents and winter maintenance which can increase the numbers of accidents if it leads to more slippery roads.

General purpose policy instruments must support actions

Institutional measures can improve pedestrian and cyclist safety indirectly by supporting the implementation of effective safety measures. Organisation of planning and implementation processes so that safety for pedestrians and cyclists can be focused are important. They will also constitute important premises for measures that can increase pedestrian and cyclist volumes and safe behaviour of pedestrians and cyclists.

Examples are specific goals for pedestrian and cyclist safety and plans designed to achieve these goals, task groups that represent the interests of pedestrians and cyclist, and that contribute to decisions and planning processes that are relevant for pedestrians and cyclists, safety audits for pedestrian and cyclist facilities, incentives for car dealers and consumers to sell and buy cars that offer good pedestrian protection.

Some measures have a high cost-benefit ratio

Evaluations of safety measures for pedestrians and cyclists by cost-benefit analysis may take into account a number of factors in addition to safety. It is particularly important to take into account that safety measures may change the amount of walking or cycling. Monetary valuations that can be used in cost-benefit analyses are available for killed and injured road users, travel times, vehicle operating costs, environmental impacts (noise, pollution), and health impacts (insecurity, short term sick leave, serious illness). Safety measures for pedestrians and cyclists that yielded net cost-benefit ratios greater than zero (benefits are greater than costs) are:

- combined sidewalk and cycle path at motor vehicle volumes above 8 000,
- grade-separated crossings for pedestrians and cyclists at motor vehicle volumes above 8,000,
- improvement of pedestrian crossings at motor vehicle volumes above 1 200.

Safety measures for pedestrians and cyclists that have been evaluated with cost-benefit analysis that yielded net cost-benefit ratios below zero (cost greater than benefits) are traffic signals at pedestrian crossings and marking of cycle paths.

Pedestrians and cyclists account for a minor proportion of all road traffic, but have a considerably higher injury rate than other road users. The risk pedestrians run in road traffic is imposed by other groups of road users. A transport policy that increases the amount of walking and cycling would probably increase the total numbers of pedestrian and cyclist accidents and injuries. However, this will make the motorised road users less dominant and would thereby also decrease accident risk for each pedestrian and cyclist, and promote a more fair distribution of injury rates between non-motorized and motorized road users.