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Authors: Knut Veisten, Kjartan Sælensminde and Karl-Erik Hagen
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Summary:

Bicycle injuries, risk of cycling and the tool for cost-benefit analysis of measures towards cycling

This report deals with three issues regarding bicycle accidents and cost-benefit analysis of measures towards cycling. First an overview is presented over the total extent of cyclist injuries - including the non-recorded - and the economic costs of these. Then bicycling risk is analysed, making a distinction between pure road section risk and pure crossing risk, and this is illustrated by means of example figures. Finally some of these elements of bicycle accidents and risk are included into a tool for cost-benefit analysis of measures towards bicycling.

The extent of cyclist injuries and their costs

In this report we present new estimates of the total extent of cyclist injuries in Norway. For this purpose we have combined hospital data from parts of the country with police based data from the same areas, and we have then applied the estimated underreporting with respect to injury severity. With such an approach we find a weighted reporting percentage of approximately 13%, i.e., ca 7.7 of 100 cyclist injuries (treated at hospitals / casualty clinics) will be found in Police records – and thus in the accident statistics of Statistics Norway and the STRAKS register of the Public Roads Administration. For the year 2004 we estimate a total amount of about 5650 injured cyclists (in police records and/or treated at hospitals / casualty clinics), against 726 in the public statistics.

Primarily single accidents (nearly 80% of all bicycle accidents) with low injury severity are treated at hospitals / casualty clinics. Also the cyclist injuries that are reported to the police, most of these resulting from collisions between bicycle and motor vehicle, cause a relatively low injury severity – nearly 90% with only slight injury. When regarding the total amount of cyclist injuries (both hospital recorded and police recorded) well above 95% will comprise only slight injuries. Thus, even if the non-registered cyclist injuries are considerable, a reduction of the collision accidents will have a greater economic weight than the reduction of single accidents, if the difference in injury severity is considered.

A calculation of total bicycle injury costs does not provide a measure of the pain and grief that cyclist injuries lead to. Neither does it provide numbers that can be plotted directly into a cost-benefit analysis. However, it provides a good indication

The report can be ordered from:
Institute of Transport Economics, PO Box 6110 Etterstad, N-0602 Oslo, Norway
Telephone: +47 22 57 38 00   Telefax: +47 22 57 02 90

of the economic resources that people themselves would have applied (re-disposed) to reduce accident risk (similarly to insurance premiums), in addition to the resources that the public sectors and others apply on cyclist injuries. For 2004 we estimate the economic costs to more than NOK2 billion. Even if peoples' willingness-to-pay is not materialised through payments, such estimates still show how much better off they would be for given risk reductions. Such a consumer surplus, due to a project that reduces risk / accidents / injury severity, is an economic welfare measure that can be compared to other economic values in a cost-benefit analysis. An injury reduction would release resources in the health sector and other sectors for alternative use – for 2004 it was estimated that such accounting costs (a part of total economic costs) reached nearly NOK700 million. Those cost elements that we have considered are all included in the accident values that the transport sector and the Public Roads Administration apply in their cost-benefit analyses.

Inclusion of all cyclist injuries treated at hospitals would extend the data base for identification of black spot areas. This information would be more valuable if hospital data also included standard accident description and accident location, similarly to what is found in existing public data. If patients were asked to describe the accident in everyday language, a data programme, e.g., in a palmtop, could identify the type of accident and give it a code according to the coding system applied in police records. Similarly, the accident could be located by asking the patient to provide street names or well-known sites or just point directly to a GIS-based map in a palmtop.

New data can provide far more knowledge about bicycling, bicycle accidents and bicycle risks in Norway

In addition to an improved accident recording a more complete and detailed bicycle counting would provide more knowledge about bicycling, bicycle accidents and bicycle risks in Norway. Bicycle counts can provide additional and more precise data on cycling/exposure in different parts of the country in relation to what we currently obtain from the Norwegian Travel Survey. Detailed bicycle counts may also provide a basis for estimating how much of the cycling occurs on cycle paths, on cycle lanes, mixed with motor vehicles, etc. Good public bicycle injury data and bicycle counts will also enable estimation of accident prediction models and injury severity models – with exposure (AADT-bicycle, AADT-walk, AADT-car) and road characteristics as explanatory variables. At some elected locations the bicycle counting could be combined with interview data to obtain a richer risk analysis including accident description, exposure, road characteristics, bicycle characteristics and individual characteristics.

When a road section is changed, e.g., establishing a cycle lane in a street where bicyclists earlier have mixed with motor vehicles, changes in accidents/risk may occur both on the new section and in eventual crossings on the new cycle lane. By estimations and example numbers we have showed how measures on sections and crossings can be viewed in connection. In this manner one may assess both separate section effects (without crossing effects) and combined section and crossing effects. Even if it is the combined effect that enters into a cost-benefit analysis of road section projects, the decomposition of effects will clarify which type of section measure and crossing measure that should be combined.

The zero vision and possible developments of the cost-benefit analysis tool of the transport sector

The holistic approach in cost-benefit analysis (and impact analysis in general) is not necessarily inconsistent with the priority of reducing/eliminating fatalities and serious/severe injuries implied by Vision Zero. Cost-benefit analysis is adequate for the identification of the most cost-efficient ways of reducing accident risk. Thus, cost-benefit analyses may prove useful in approaching the ideal that the Vision Zero envisages (Elvik 2001). However, the quality of input data is crucial for the possibility of using cost-benefit analysis as a foundation for decision-making. In the development of cost-benefit analysis as a tool for prioritizing cycling and walking the need for obtaining improved input data has been emphasised, such that cost-benefit analysis of measures targeting cyclists and pedestrians is possible at all (Sælensminde 2004b).

Some data/knowledge is already available – both police recorded accident data, accident costs, exposure (stated cycling in travel surveys), and risk at a national macro level. It is possible to make economic calculations on accident effects, insecurity effects and time use effects of crossing facilities, and for road section measures economic calculations can be made for health effects, environmental effects and land use effects given increased cycling/walking (Sælensminde 2004b). Health effects will potentially constitute a heavy item in a cost-benefit analysis, together with accident effects and eventual time use effects. The proposed CBA tool for impact analysis (*Håndbok 140*) provides a good point of departure for filling knowledge gaps and improving CBA. We have identified elements related to bicycle accidents and injuries that may be included in such an upgrading of the tool, e.g., showing how to calculate combined section and crossing measures and how to include injury severity changes. A next important development will be the inclusion of dynamic effects – especially that the risk for the individual cyclist can be reduced if more people cycle (Krag 2004, 2005a).

An improved base of data and knowledge about cycling, cycle accidents and cycle measures will not benefit solely the cyclists. If more people choose to cycle (or walk) instead of driving a car, this will yield more space in the transport network for remaining car drivers and better air quality for everybody. If this can be achieved without a risk increase for individual road users, such a change would obviously be following a sustainable development and be compatible with Vision Zero. Measures that contribute towards such a development path will most probably be economically efficient (Sælensminde 2002a, 2004a). It is organizational/institutional barriers (sector crossing effects and budgeting issues) rather that economic inefficiency that curbs measures towards cycling and walking. E.g., it is the health sector that can provide the necessary extension and correction of the accident recording, while the sector of justice can contribute on traffic control. The transport sector itself should possibly increase the status of cycling (and walking) as a means of transport, e.g., provide data on ADT for cycling on road sections in the same manner as ADT for motor vehicles.

People are different, as folk wisdom tells. Notwithstanding the quality of the cycle transport network, probably much less than half of the road users will switch from driving their car or switch from going by bus/tram/train. However, although Denmark and the Netherlands are much more flat countries than Norway, and somewhat more urban societies with slightly shorter winters, these two countries indicate a comparatively realistic potential for cycle transport. A change towards Danish or Dutch conditions will imply considerable effects on transport, but also on environment and health.