Institute of Transport Economics
Norwegian Centre for Transport Research

Summary

Will the zero-growth objective lead to more traffic injuries?

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Author: Torkel Bjørnskau
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It is a political goal that traffic growth in urban areas should take place through cycling, walking and public transport. More cycling and walking will lead to more injuries, but first and foremost more lighter injuries. The number of seriously injured will probably not increase much even with many thousands more cyclists and pedestrians. But it depends on good infrastructure for cyclists and pedestrians. Increased effort in terms of operation and maintenance of the infrastructure could result in fewer injuries.

What happens when future work trips are to happen by cycling and waking and not by car?

It is a political goal that traffic growth in urban areas should take place through cycling, walking and public transport. It is well documented that cycling and walking are more risky than driving a car, which means that more traffic injuries can be expected when future travel trips will take place during cycling and walking.

Based on updated risk figures for cyclists and pedestrians derived from recent registrations of injuries by Oslo University Hospital (Emergency unit), we have calculated consequences in terms of expected number of injuries and expected number of severely injured by various types of travel in Oslo and Akershus.

Figure S1 shows a principle sketch for the type of travel that has been included in the calculations. At the top, a travel chain is shown from home to work consisting of walking, bus ride and walking. In the middle there is illustrated a work trip only carried out by bicycle, and at the bottom a work trip by car, but with walking to and from parking. In the calculations, the expected injury rate for the entire journey will be the sum of the expected number of injuries for the various elements of the travel chain.

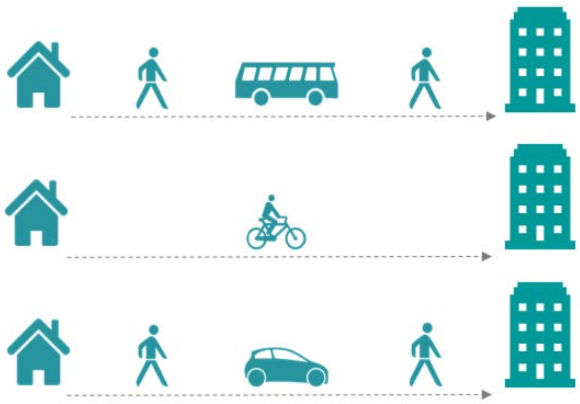

Figure S1. Principle sketch for travel chains that are included in calculations of expected injury figures

The calculation of an expected injury rate for various work trips is based on the risk of different modes of transport on each part of a travel chain. Expected number of injuries for each part of the travel chain is calculated by multiplying the risk in the various travel elements with the distance in the various travel elements. The expected number of injuries for the whole travel is then summed over all travel elements. In addition, we have weighted this expected injury rate with a so-called "Safety in Numbers" effect (SiN effect), which indicates that the increase in injury rates will normally be less than the increase in traffic.

Accidents and injuries do not increase proportionally with traffic

It is well documented that when traffic increases, the number of injuries also increases, but the increase in injuries is lower than the increase in traffic. This is often referred to as "Safety in Numbers" (SiN effect), and the mechanism may be that, for example, drivers become more aware of cyclists or pedestrians when there are many of them in traffic. But there are also studies that show that even single accidents increase less than proportionally when the number of cyclists increases. The explanation for this is probably that increased cycling is linked to better infrastructure for cycling and that this also reduces the risk of cyclists. To account for such mechanisms, we have assumed a SiN effect of 0.8, for cyclists and pedestrians, i.e. when the number of cyclists (or pedestrians) increases by 1 %, the number of injuries increases on average by 0.8%.

Future scenarios

We have calculated the injury consequences of moving future work trips in the following scenarios:

1. From car to bicycle between Akershus and Oslo
2. From car to bus between Akershus and Oslo
3. From car to train / subway between Akershus and Oslo
4. From car to walking within Oslo

We have assumed a journey length of 10 km between Akershus and Oslo, and 2 km inland in Oslo. For each scenario, we have quantified the consequences if 10,000 and 20,000 person’s future work trips are conducted in ways other than by car (as car driver). We have quantified this both in terms of total number of injuries and the number of severely injured persons.

More cycling and walking – more light injuries

Table S1 shows an overview of the consequences for all types of injuries of the four scenarios we have presented above. Table S2 shows a similar overview of the consequences in terms of the number of severely injured in the four scenarios.

Table S1. Expected number of ***injured persons*** *per year in four different scenarios where future work journeys occur with other forms of transport than passenger cars. Calculations based on that respectively 10,000 and 20,000 people in the Oslo area choose other means of transport than passenger cars.*

Scenario	10 000	20 000
1) From car to bicycle, distance 10 km, SiN effect for bicycle = 0.8	94	158
2) From car to bus, distance 10 km, + walking distance 200 m	10	20
3) From car to train, distance 10 km, + walking distance 400 m	7	14
4) From car to walking, distance 2 km, SiN effect for pedestrians = 0.8	33	54

The consequences are rather moderate if future work trips happen by bus or train instead of by car and the reason we can expect an increase in the number of injuries is because we have assumed that public transport include walking to and from the stop / station. It is the risk of walking that leads to increased number of injuries in these calculations. If future work trips take place in the form of walking or cycling alone, the consequences for the injury figures is much larger. The explanation is that these means of transportation have a higher risk of injury than car and public transport.

Table S2. Expected number of ***severely injured persons*** *per year in four different scenarios where future work journeys occur with other forms of transport than passenger cars. Calculations based on that respectively 10,000 and 20,000 people in the Oslo area choose other means of transport than passenger cars.*

Scenario	10 000	20 000
1) From car to bicycle, distance 10 km, SiN effect for bicycle = 0.8	8	14
2) From car to bus, distance 10 km, + walking distance 200 m	1	1
3) From car to train, distance 10 km, + walking distance 400 m	0	0
4) From car to walking, distance 2 km, SiN effect for pedestrians = 0.8	4	7

Table S2 shows that the consequences in terms of severely injured are much less than for all types of personal injury. Using public transport instead of car has hardly any consequences in terms of more (or fewer) severely injured. To the extent that we find such consequences, we see again whether it's more walking or cycling that leads to an expected increase in the number of severely injured. But also for these means of transport, the increase is quite modest.

The calculations are uncertain

The calculations are based on a number of assumptions that are more or less uncertain. This applies to the risk figures, which are not restricted to travel purposes, and which to a limited degree are adjusted by gender and age. There is also a very uncertain risk figure for passengers on public transport, and there are uncertainties associated with the under reporting of injuries for drivers. However, this has relatively little significance for the results.

The biggest uncertainty is related to the SiN effect. We have assumed such an effect of 0.8 for cyclists and pedestrians. This is based on foreign studies, and it may be argued that the effect should be stronger. The reason why we have chosen such a moderate SiN factor is that most of the injuries caused by pedestrians and cyclists are after single road user accidents, and for such accidents, the SiN effect is much less than for collisions. We have also conducted sensitivity calculations with SiN effects on respectively 0.7 and 0.9. The results show that the effects on all injuries are very sensitive to which SiN effect is assumed, but that is to a much lesser extent the case if we limit the analysis to the severely injured ones that are relevant in a vision zero perspective.

Conclusion

We can expect an increase in the number of people injured if future work trips to and from Oslo and in Oslo occur through more cycling and walking. If this happens in the form of increased use of public transport, we expect almost no increase in the number of injuries. Most of the increase in injuries for pedestrians and cyclists will be caused by single accidents predominantly resulting in slight injuries. But the calculations also show that the number of severely injured can be expected to increase, albeit modestly. The calculations are based on injury data collected by the Oslo University Hospital (Emergency unit) and they also show that there is a very high safety potential of better operation and maintenance for cyclists and pedestrians. With even better operation and maintenance, the risk will be reduced, and thus the injury consequences of transferring future car journeys to walking and cycling could be less than assumed in our calculations.