

Summary:

More persons in the cars? Status and potential for change in car occupancy rates in Norway

Results from national travel surveys in Norway show that the car occupancy rate has been gradually reduced since 1985, and is lowest for commuting trips. The occupancy rate varies according to the purpose of the trip and the number of children in the household. Area of residence is not a major factor. The potential for increased occupancy is greatest for routine based work trips with low occupancy level.

Several ways to calculate car occupancy rates

The number of people on average in each car can be measured and calculated in various ways. It can therefore be difficult to compare figures from different countries and studies. Most of them are based upon manual traffic counts or travel surveys. The advantages of using manual traffic counts is that one gets the occupancy rates on concrete routes and time of day, while using travel surveys and the like provides more information about the trip (e.g. length and purpose) and the persons who are in the car. A third possibility is to use traffic models to calculate the car occupancy rates.

Not all changes in occupancy rates affect the traffic load

To make sure that changes in occupancy rates affect traffic flow and environment, it is a prerequisite that increased occupancy rates is linked with fewer cars on the roads. An increased occupancy rate is only interesting in those cases which it increases because someone leaves their car behind, not because they change from public transport, or fill the car with family members or others who would not otherwise have driven a car. Change in occupancy rates can have other explanations than more passengers in each car.

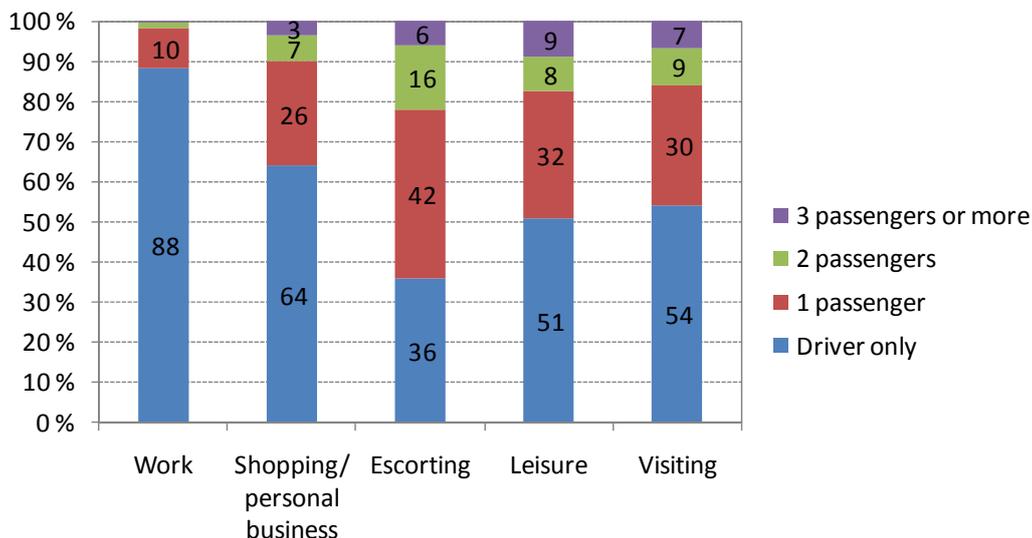
- If it is more common to drive children to kindergarten and school rather than follow them on foot or let them walk alone, the result is increased occupancy rates accompanied by increased traffic.
- If more people choose to be car passengers rather than go by public transport, it can also lead to increased occupancy rates. Such a change will have no impact on traffic load.

- If increased occupancy rate means that one has to drive over longer distances to pick up or drop off passengers, reduced traffic may not be the result.

Status and development in occupancy rates

In most countries car occupancy rates show a decline in the long term. Although figures from different countries have different basis, they show the same tendency. The occupancy rate is lower for travel to / from work than for all other types of trips. Household size is of importance for occupancy rates, and most car passengers belong to the driver's household. This is often called "fam pooling".

In Norway in 2005, 54 per cent of all trips were as car drivers, while 12 percent were as car passenger. A closer look on the car driver trips shows us that 63 per cent are solo driver trips. Every fourth trip has one passenger, while 11 per cent of the trips have two or more passengers. Figure S1 shows mainly solo drivers on work trips, and more passengers on escorting trips.

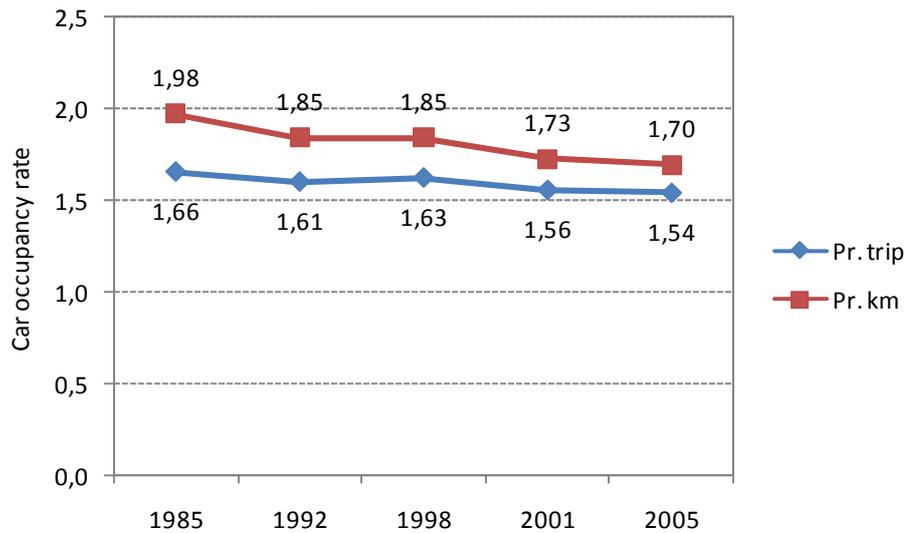


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Figure S1: Number of persons in the car by purpose of the trip. Car driver trips, Norwegian National Travel Survey 2005. Per cent

Moderate decline

The general impression is a decline in occupancy rates in Norway (Figure S2). In 1985, the average occupancy rate was 1.66 per trip, while in 2005 it was reduced to 1.54. This occurred simultaneously with growth in car ownership. The proportion with access to a car has increased from 84 percent in 1985 to 87 percent in 2005, while the proportion with access to two or more cars has increased from 25 to 39 percent.

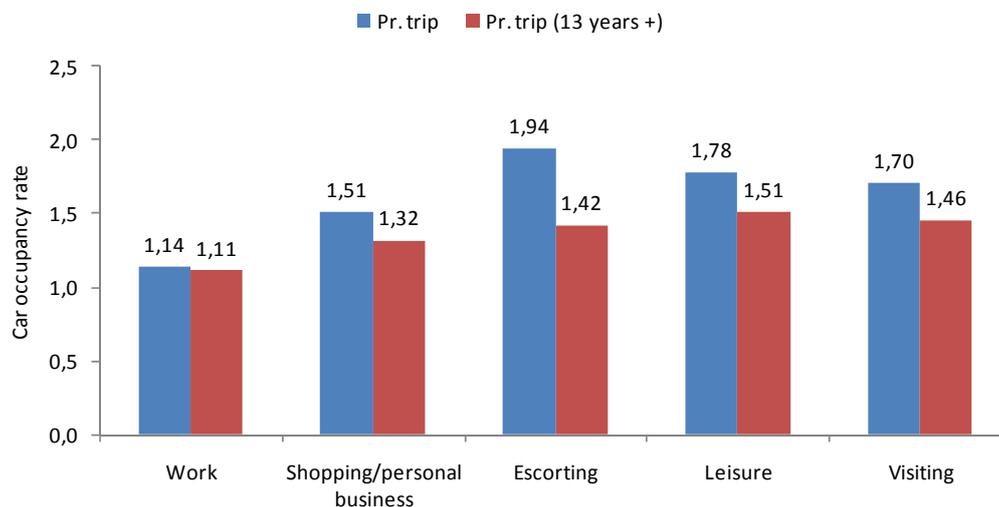


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Figure S2: Average occupancy rates in Norway, pr. trip and kilometre. Car driver trips, Norwegian National Travel Survey 1985-2005.

Low occupancy rates on work trips

Figure S3 shows that the occupancy rates varies from 1.14 for commuting to 1.94 on escorting trips, but the differences are reduced if we do not include passengers under 13 years. This tells us that "fampooling" is an important contribution to the occupancy rates, even if the figures do not tell us if all the children the drivers transport are their own children.

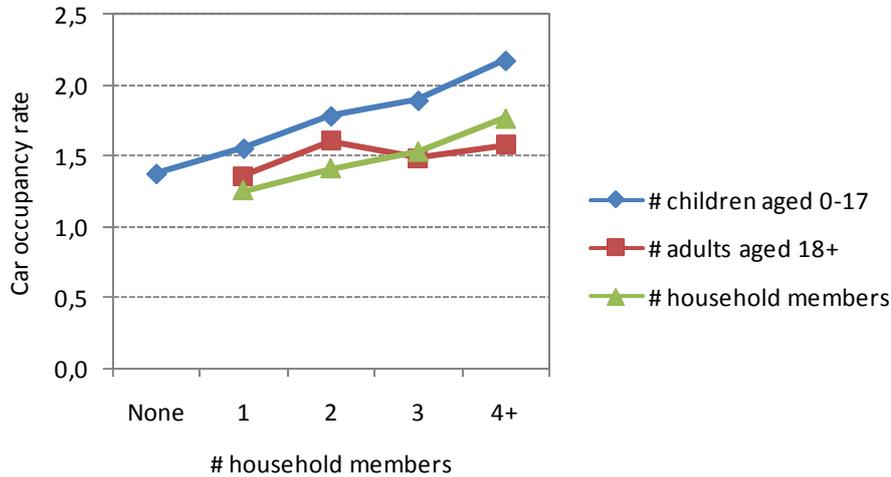


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Figure S3: Car occupancy rates by purpose, with and without passengers under 13 years. Car driver trips, Norwegian National Travel Survey 2005

Number of children is most important

Figure S4 shows the relationship between the number of persons in the household and the car occupancy rate. It confirms that occupancy increases with the size of the driver's household. We also see that it is the number of children that is of importance, not the number of adults in the household.



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Figure S4: Car occupancy rates pr. trip based on number of children, adults and people in total in the driver's household. Car driver trips, RVU 2005

Location not important for occupancy rates

The occupancy rate varies little by area of residence. Table S1 shows that in 2005 surrounding municipalities of the major cities had the lowest occupancy rate. Oslo has the highest occupancy rates pr. km. It is probably because car owners in Oslo use the car for longer trips and not so much on the shortest trips. The occupancy is also slightly higher pr. km outside the largest cities. Based on where in the country one lives, there are small differences when it comes to occupancy rates pr. trip. The occupancy rates pr. km are however slightly higher in northern Norway. The main reason is that they have longer trips with higher occupancy rates. The occupancy rate does only show minor geographical variations, probably because we compare car drivers, not the travellers in general.

Table S1: Occupancy rates by type of residence. All types of trips and work trips. Car driver trips, Norwegian National Travel Survey 2005

Type of residence	All trips		Commuting trips	
	Pr. trip	Pr. km	Pr. trip	Pr. km
Oslo	1.55	1.78	1.10	1.11
Vicinity of Oslo	1.51	1.60	1.13	1.15
Bergen/Trondheim/Stavanger	1.56	1.62	1.15	1.19
Vicinity of Bergen/Trondheim/Stavanger	1.53	1.61	1.08	1.07
The remaining six largest cities	1.56	1.68	1.13	1.18
Smaller cities	1.53	1.71	1.17	1.24
The rest of the country	1.54	1.76	1.15	1.24

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Carpooling – why (not)?

For some trips the passenger is essential. The purpose of the trip to kindergarten is to transport passengers. Thus, the occupancy rates on these trips are high. The same applies to other trips where one brings those one resides with. Longer weekend trips are conducted mostly because one bring the family visiting or to the holiday home. There is no reason to assume that the occupancy rates on these trips could be increased.

Carpooling has both advantages and disadvantages compared to driving alone or compared to travelling by public transport. It is cheaper to carpool than to drive alone, and it may also be cheaper than public transport. Regarding travel time, carpooling will in most cases pay off compared to public transport, but this also depends on the public transport supply. If passengers need to be collected beyond the original travel route carpooling can increase travel time compared to driving alone. Carpooling reduces the flexibility one has by using the car alone, and public transport can also often be more flexible than carpooling. Perhaps the most important barrier against carpooling is the greater obligation to interact with fellow passengers compared to both public transport and solo driving. Many people need time alone in the car, but at the same time it can be relaxing to be a passenger once in a while.

Measures for increasing occupancy rates

Measures for increasing occupancy rates are often combined with measures for reducing travel activity or changing transport behaviour. The main focus here is measures that are directly intended to affect occupancy rates.

Generally, in order to get more people to carpool one can:

- Provide benefits for those who are not driving alone
- Reduce the disadvantages of carpooling
- Reinforce the benefits of carpooling

Flexibility

Flexibility increases if carpooling is not restricted to the permanent set of people driving fixed routes at fixed times. In the U.S., informal systems for casual carpooling or "slugging" help commuters to take advantage of greatly reduced travel time and driving costs in HOV-lanes. Those who need a ride meet on certain locations, as do drivers who need to fill up their cars. It has retained much of the anonymity from public transport, while both drivers and passengers will save time and money. A further increase in flexibility is the so-called dynamic ridesharing. Then one is released from fixed routes and times, and the pairing of driver and passenger happens in real time through a mobile phone. Such a system will be tested under the auspices of the Public Roads Administration in Bergen.

Guaranteed ride home

For many, an obstacle to carpooling is the fear of not having any opportunities to get home if there is such as illness in the family or one has to work unexpected overtime. Programs for carpooling can provide complementary transport with public transport, bike, taxi, car share schemes, other carpools or company car.

Economic benefits

Basically it is cheaper to drive together than to drive alone. It has also been made attempts to provide car poolers with various forms of bonuses and offers. International literature does not give a clear answer to what extent more car poolers arise from rewarding carpooling or increasing costs of solo driving. It is vital that the economic benefits of carpooling do not cause cyclists, pedestrians and public transport users to start to drive.

Parking measures

Opportunities for parking are significant regarding whether people drive their own car or not. Parking restrictions may affect the extent of carpooling, as can customized parking measures that provide exclusive benefits to car poolers.

One possibility is to arrange for parking where the journey starts. This may make it easier to carpool, even if the car poolers do not live near each other. Just as important as meeting places before the journey starts is parking at the destination (i.e., workplace). To encourage carpooling the employer can offer reserved parking spaces for car poolers. Such parking spaces may be free or at a reduced fee.

HOV lanes

One of the measures that are most closely associated with increasing occupancy rates is introducing HOV (High Occupancy Vehicle) lanes. The purpose is to improve traffic flow. In Norway, there has been or is HOV lanes on a handful of routes, with varying results. The cases in Norway are generally so short that it is not much time to save.

Effects of increased occupancy rates

A calculation example shows that if the occupancy rates increases by 5% and the amount of persons transported remains the same, the daily cut is four million vehicle miles on a national basis. This is equivalent to 235 000 CO₂-tonnes per year. Emissions of NO_x can be cut by almost 500 tons annually and particulate emissions (PM₁₀) by 28 tons.

The traffic is most dense in the afternoon when the occupancy rate is relatively low. This tells us that there is much to gain, and that a small increase in the occupancy rates could have a profound effect.

Effects of measures for increased car occupancy are difficult to estimate as several measures often are combined. General measures to reduce traffic will also affect the occupancy rates.

Work trips - large potential and visible effects

The occupancy rate is lowest on the work trips and has therefore the greatest potential for change, while slight increases can have major consequences in rush hour. Working trip is predictable as most trips takes place at the same time and stretch every day and carpooling should therefore be possible to achieve. That the occupancy rate during rush hour in 2005 was low in the largest urban areas shows that there is much to gain. Another factor that makes working trip especially interesting is that it is possible to organize measures to increase the occupancy rates through an employer.