The health impact of bicycle infrastructure

Paul Schepers

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Background

- Our definition of road traffic fatalities includes criteria like a crash on a public road, involvement of a moving vehicle, and death within 30 days.
- The number of fatalities and illnesses due to road traffic is much greater, particularly:
  - Inhaled air pollution among traffic participants and people living along trafficked roads.
  - Life years (lost) and gained due to (avoided) active transport.
- Bicycle infrastructure affects all of these health aspects but it is not yet common sense to address this in guidelines.
- QALYs, DALYs and Life Years Gained are all measures to combine health aspects.

Example for a modal shift from driving to cycling in the Netherlands: gain in life days per person

Source: De Hartog et al, 2010.
Goal of this study

- Compare the health impact of bicycle paths along distributor roads to roads with mixed traffic
- Hypothetical scenario: halving the length of bicycle paths in an average Dutch city

Effects

- Health impact due to a modal shift because cycling is encouraged, applies to new cyclists
- Additional direct impact applying to all cyclists:
  - Air pollution because of the separation between cyclists and the air pollution source
  - Road safety due to risk at the location level
Mobility impact of bicycle paths and related mortality effect due to increased physical activity

- Several correlational studies found no effect
- Very few before-after studies that allow an estimate of the effect at an aggregated level
- A range between 0 and 17.5% is assumed for the effect on bicycle modal share (i.e. current modal share x 1.175)
- Relative risk of all cause mortality: 0.5 - 0.9 for people who take up cycling and cycle 5 days for half an hour

Air pollution impact

- Studies find lower exposure to traffic-related air pollution on bicycle paths compared to lanes and mixed traffic: between 12 and 24% for Black Carbon (BC) and 16 to 25% for nitrogen dioxide (NO₂)
- This is translated into a equivalent change of inhaled pollution and related to the outcomes of long-term exposure studies
- Relative risk of all cause mortality: 0.9974 - 0.9998 for all cyclists due to lower exposure on bicycle paths
- Relative risk of all cause mortality due to a modal shift (De Hartog): 1.001 - 1.053 for new cyclists due to a modal shift
Road safety

- A relatively wide range of effects is reported for bicycle paths with some review studies reporting negative effects, a range between -38% and 7% is derived from these studies.
- Relative risk of all cause mortality for *all cyclists* between 0.9998 and 1.0000.
- Based on a new method introduced by Elvik (2009) the road effect of a modal shift on fatalities can be estimated to be negligible under Dutch circumstances.
- This effect is not further included.

Results per cyclist:

Two-fold change in the bicycle path length

![Graph showing gain in life days per person for different factors such as physical activity and air pollution, with results for an average Dutch city.](image-url)
Conclusion

- Bicycle paths are very likely to have substantial positive health effects
- Contrary to a hypothetical modal shift, a modal shift due to bicycle paths can avoid negative effects related to air pollution and safety

Discussion

- From the perspective of (preventive) health policies, overall health effects deserve a more prominent role in traffic policies and guidance
- Even though different health aspects can be bundled in one health score (e.g. Life years gained), these aspects may still have a very different weight in decision making
Questions