

Major transport accidents in Norway: assessing long-term frequency and priorities for prevention

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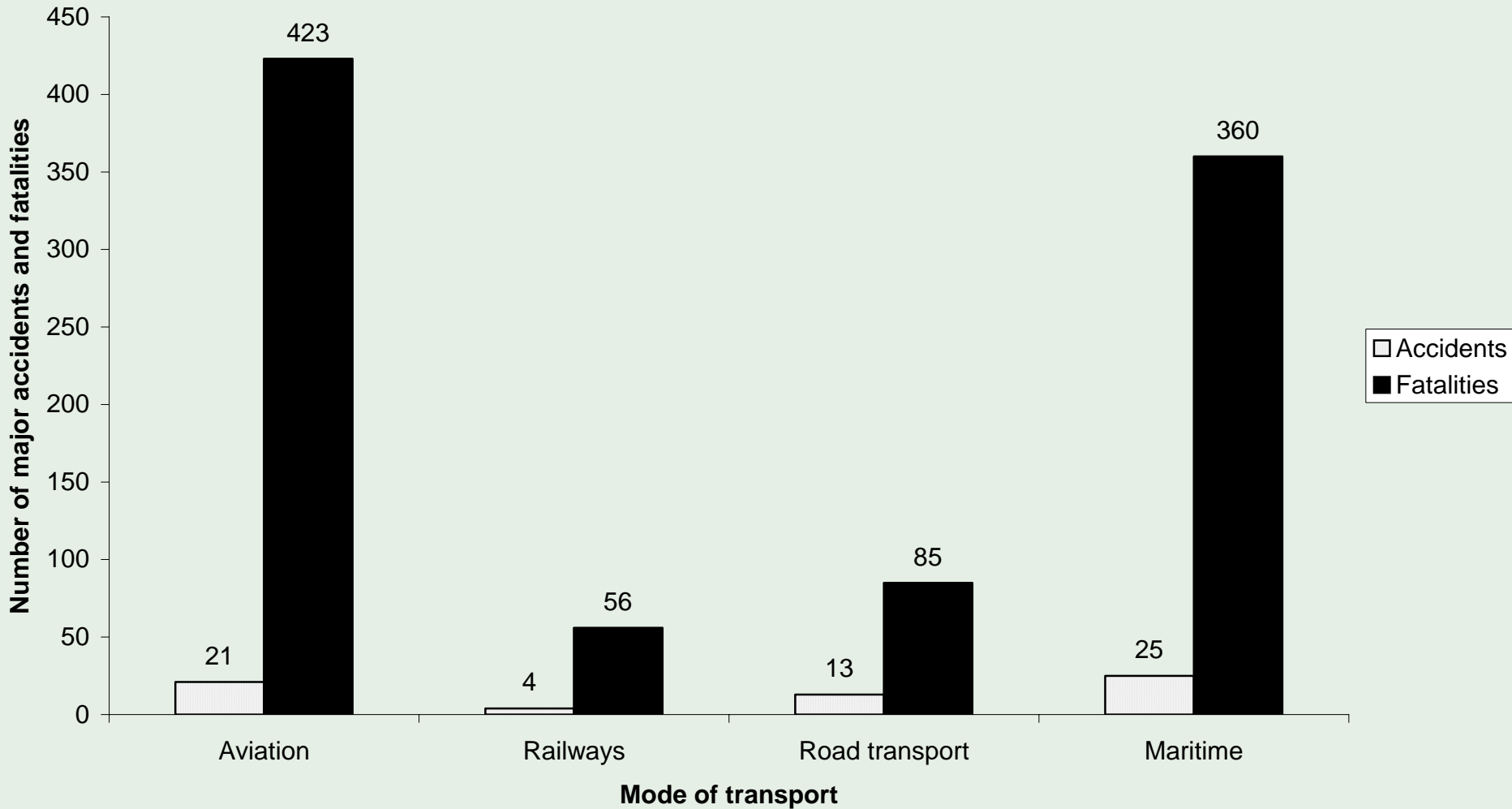
Problems to be discussed

- How many major transport accidents can be expected to occur each year in Norway?
- What is the uncertainty of an estimate of the expected frequency of major transport accidents?
- Can formal techniques for decision analysis help in setting priorities for the prevention of major transport accidents?

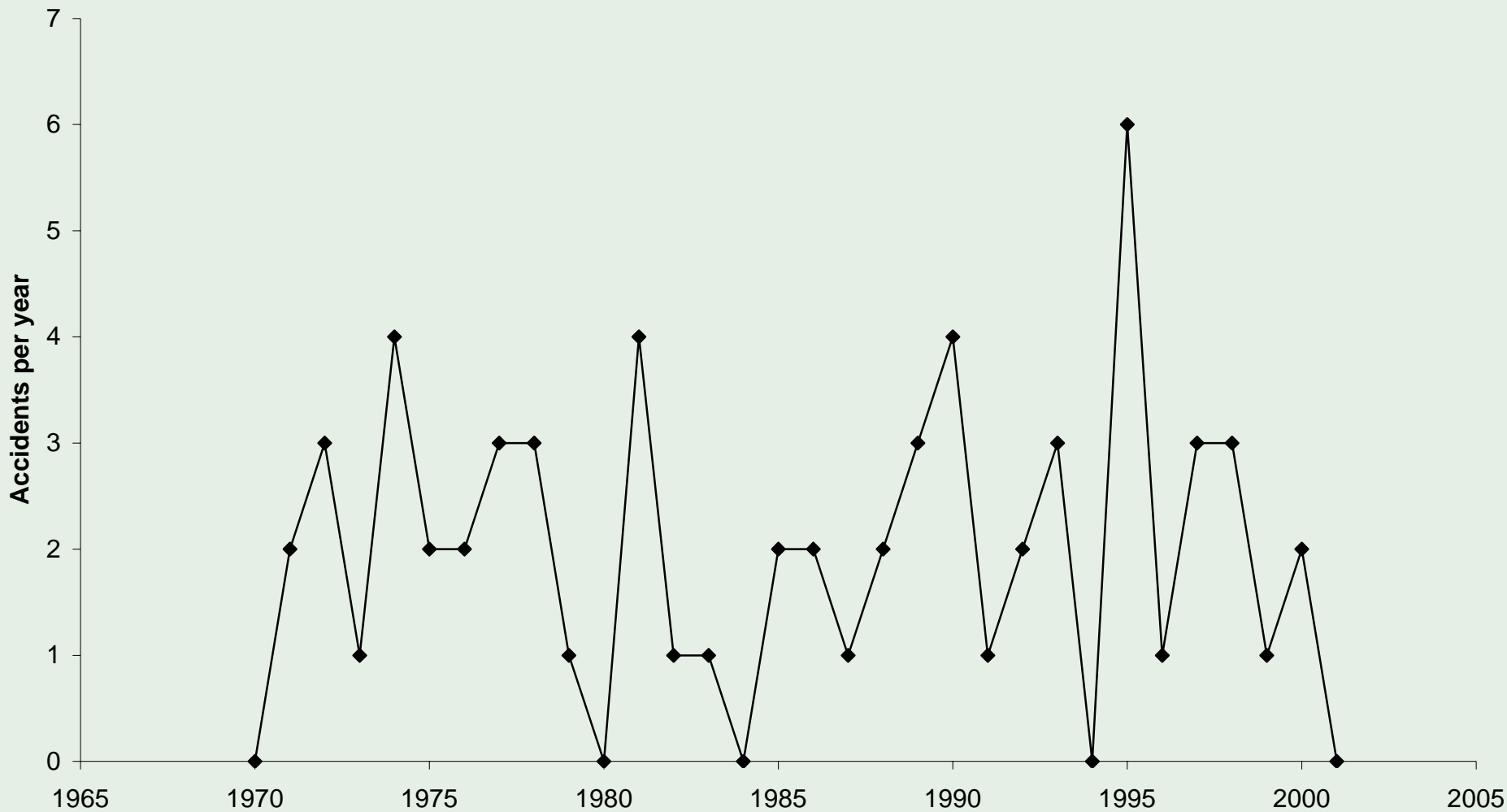
Major transport accidents

- Five or more fatalities
- Historical records for Norway 1970-2001
- Historical records for Great Britain 1967-2001
- Historical records for Europe 1991-2003
- Records may not be complete

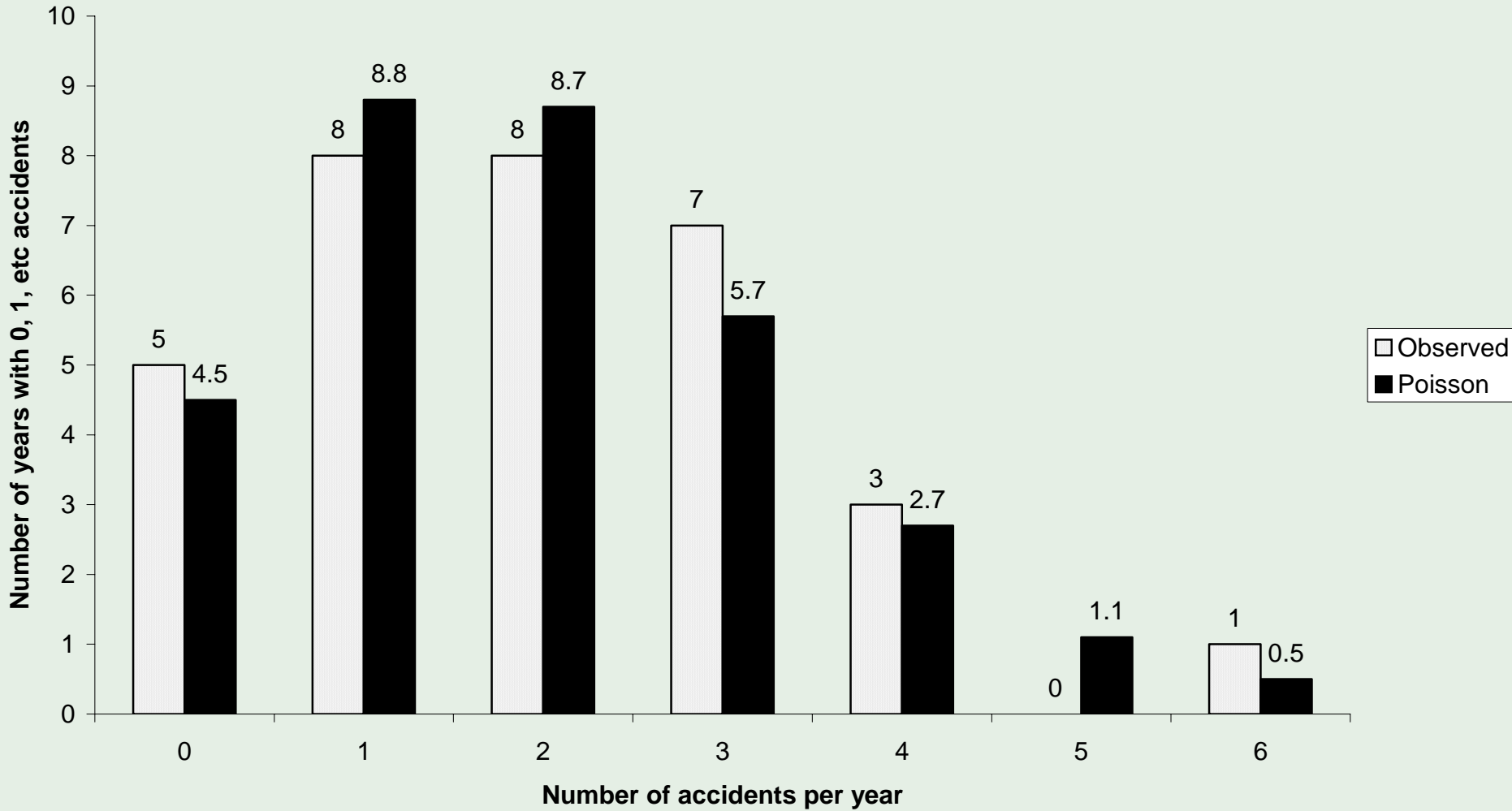
Major transport accidents in Norway 1970-2001



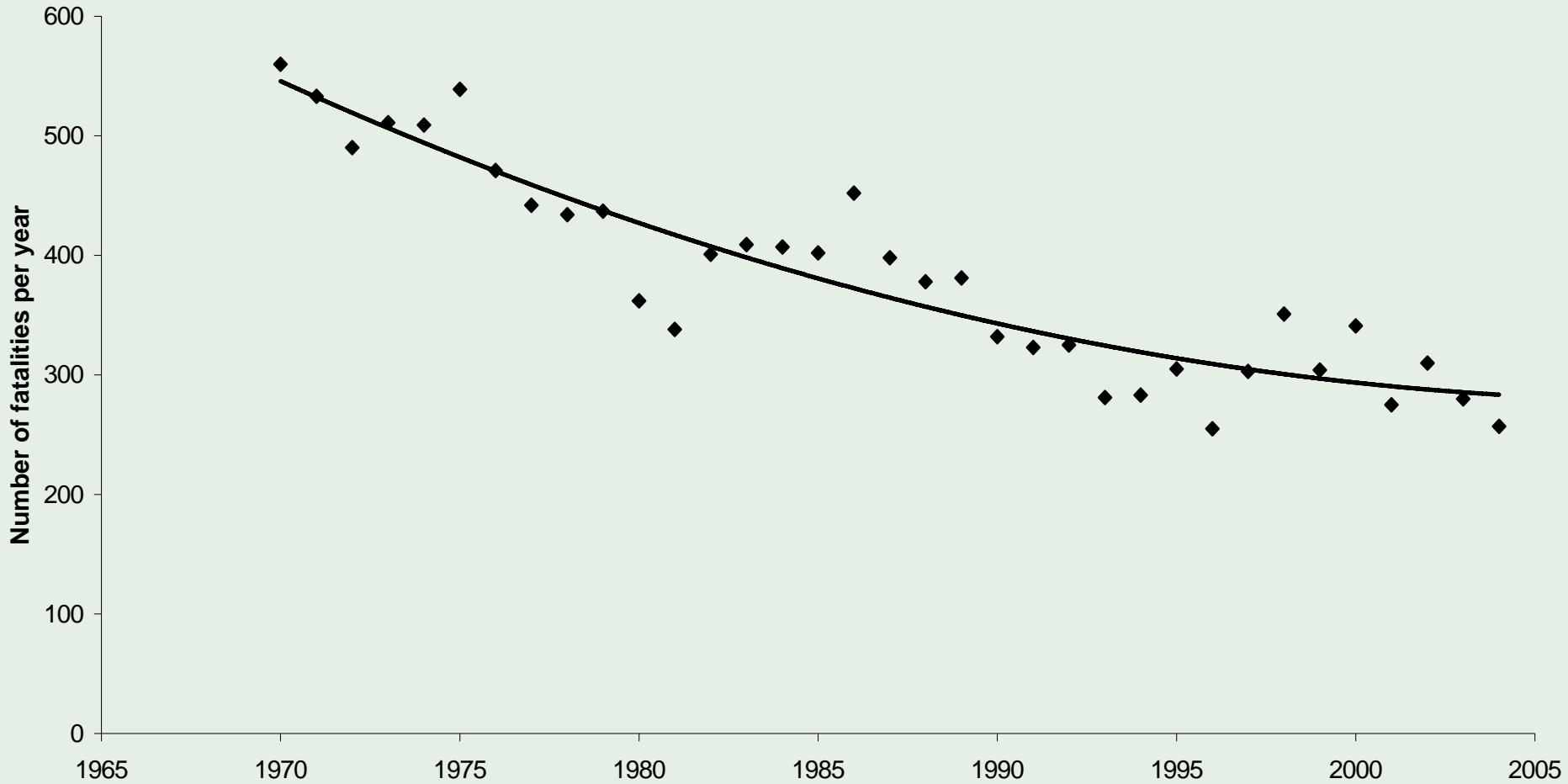
Major transport accidents in Norway 1970-2001



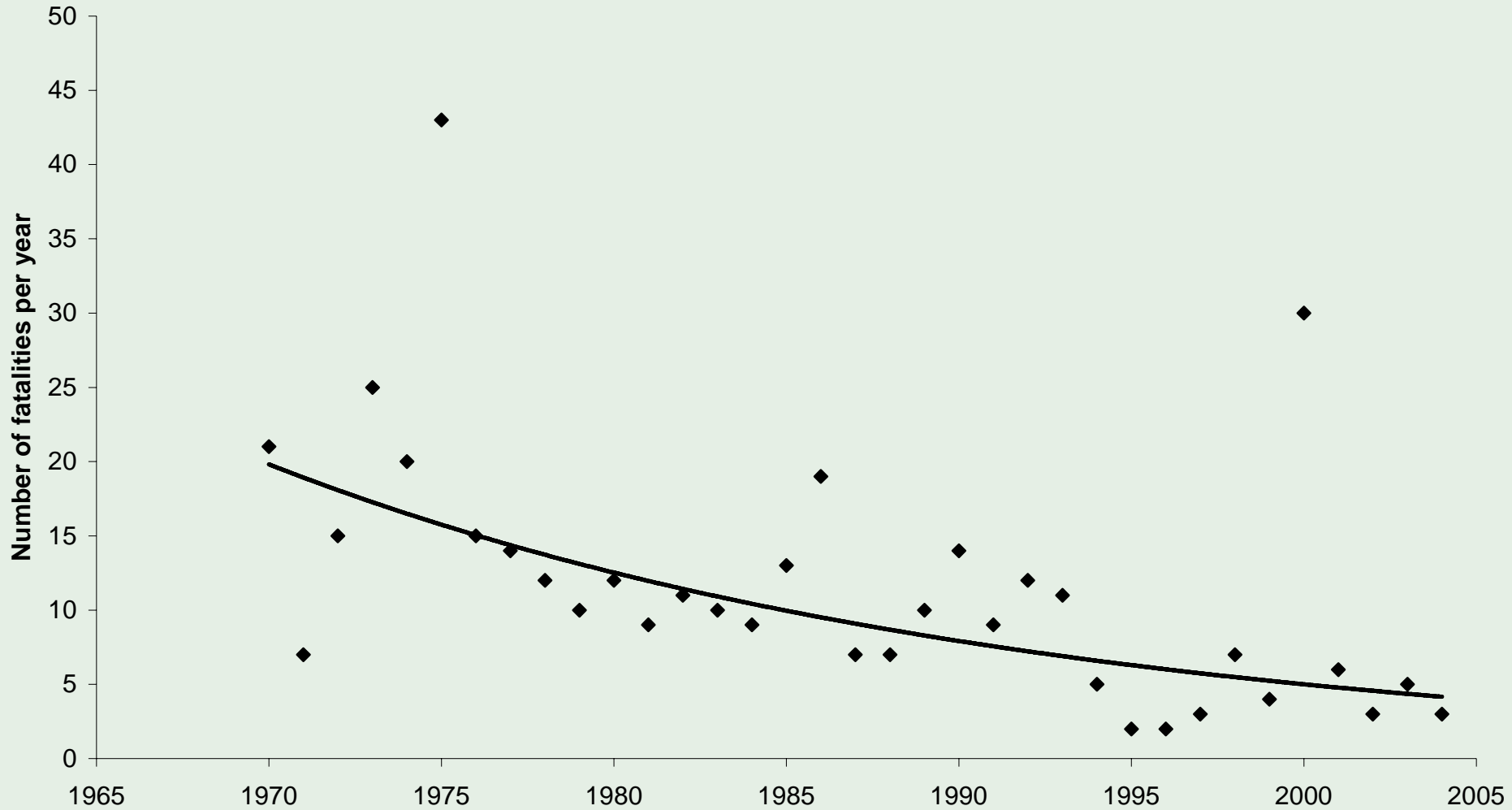
Major transport accidents occur randomly



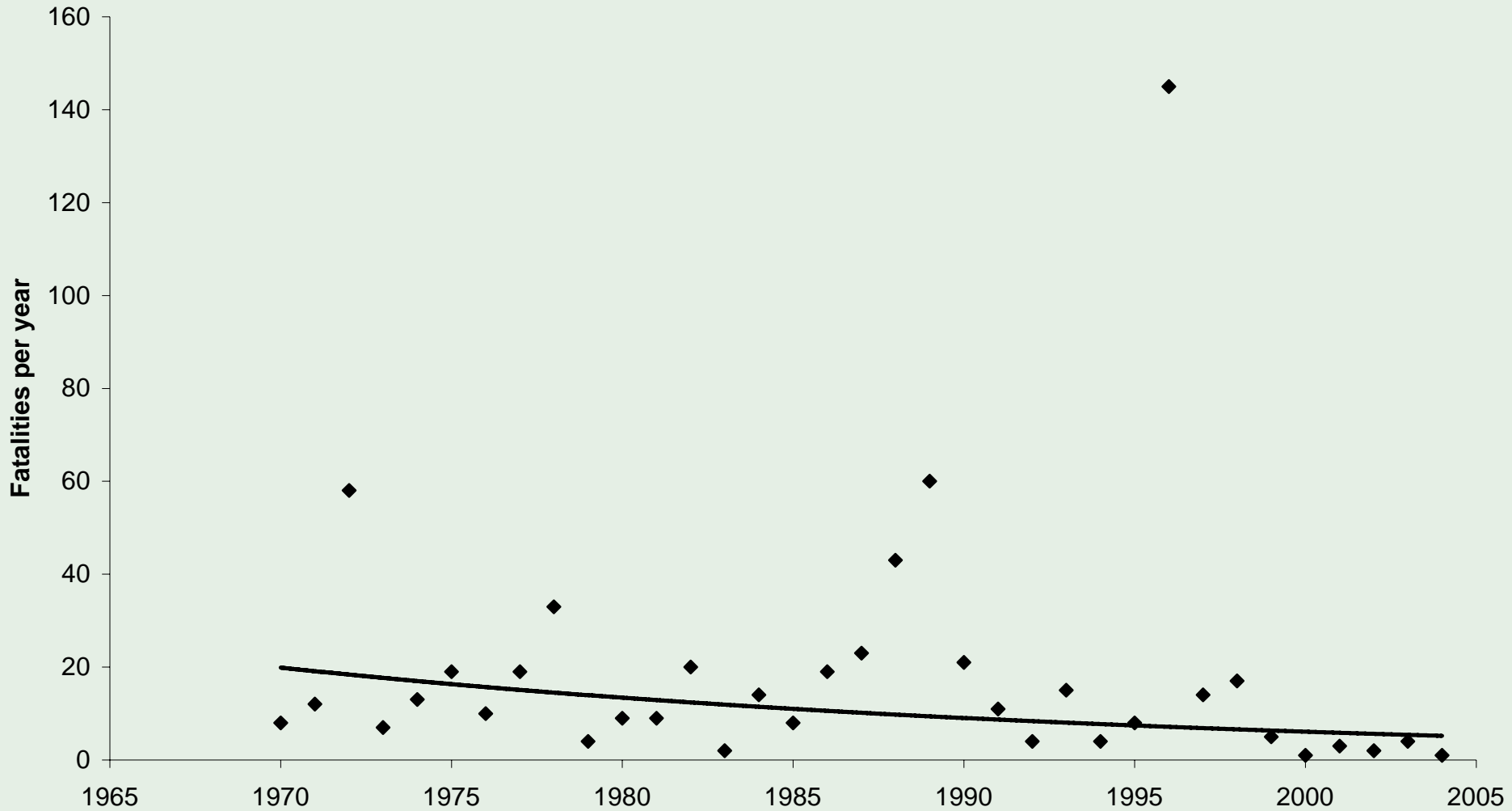
Road accident fatalities (all fatal accidents) in Norway 1970-2004



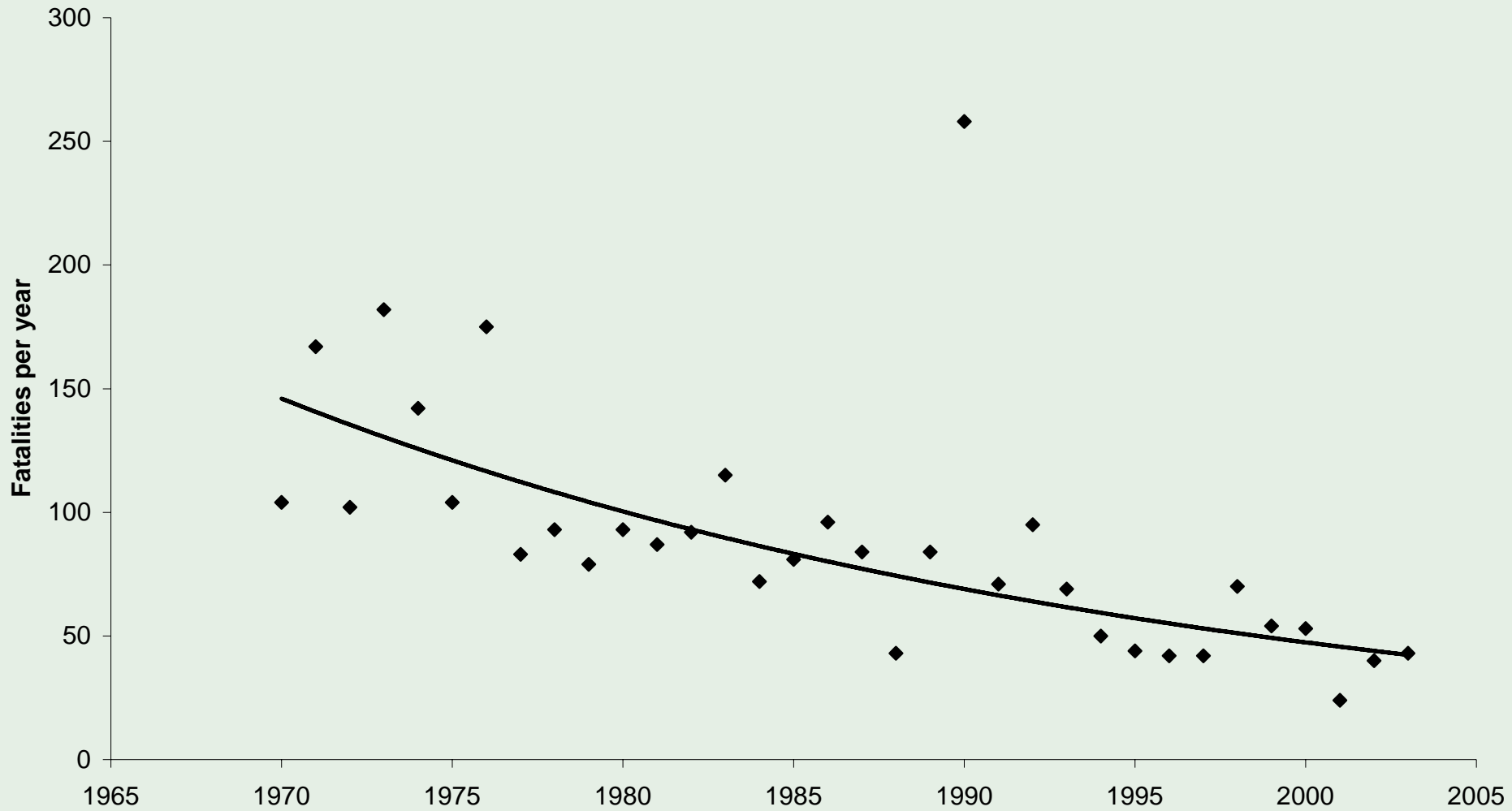
Fatalities in rail transport (all fatal accidents) in Norway 1970-2004



Aviation fatalities in Norway (all fatal accidents) 1970-2004



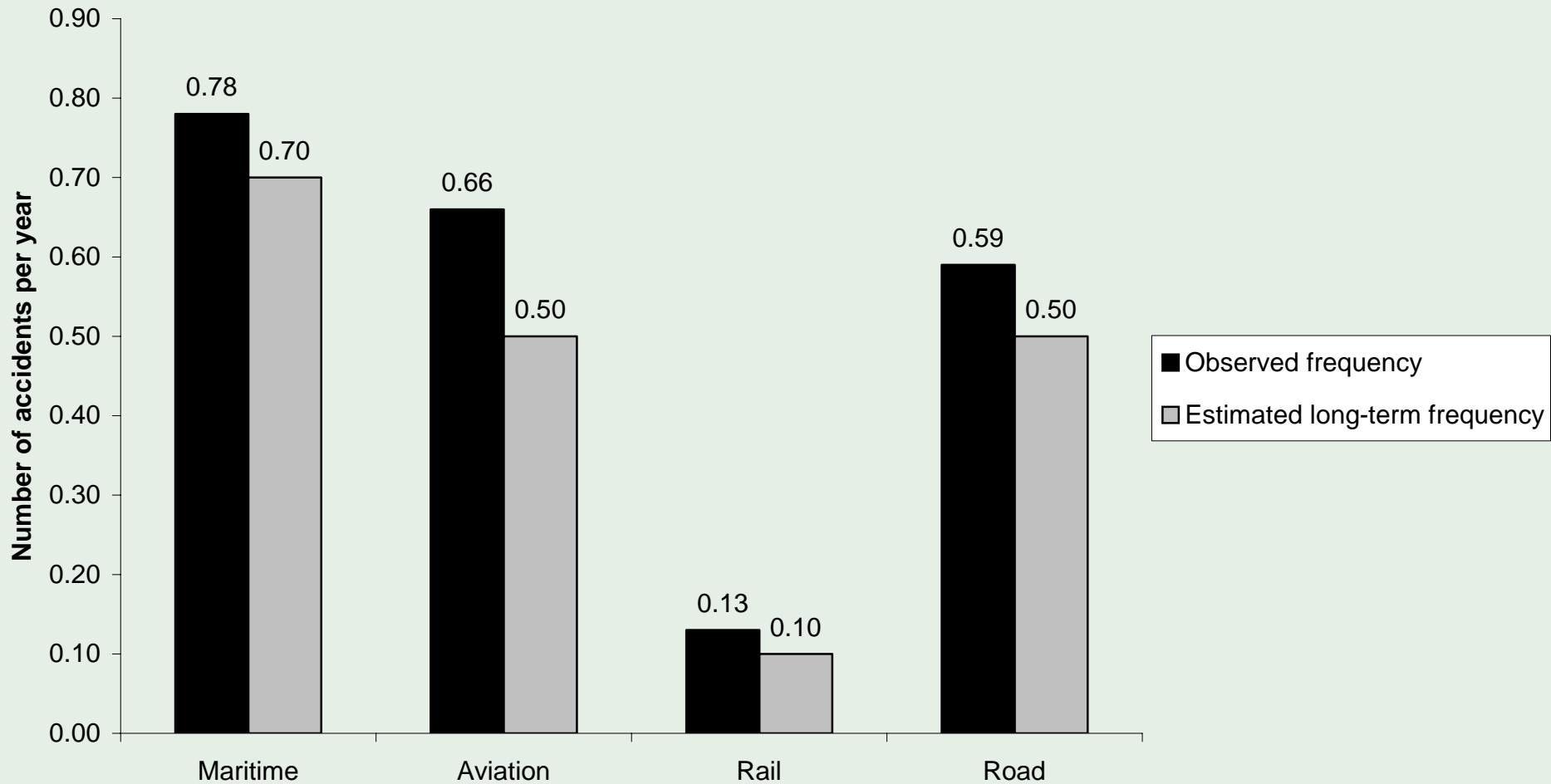
Maritime fatalities in Norway 1970-2003. Recreational boats included



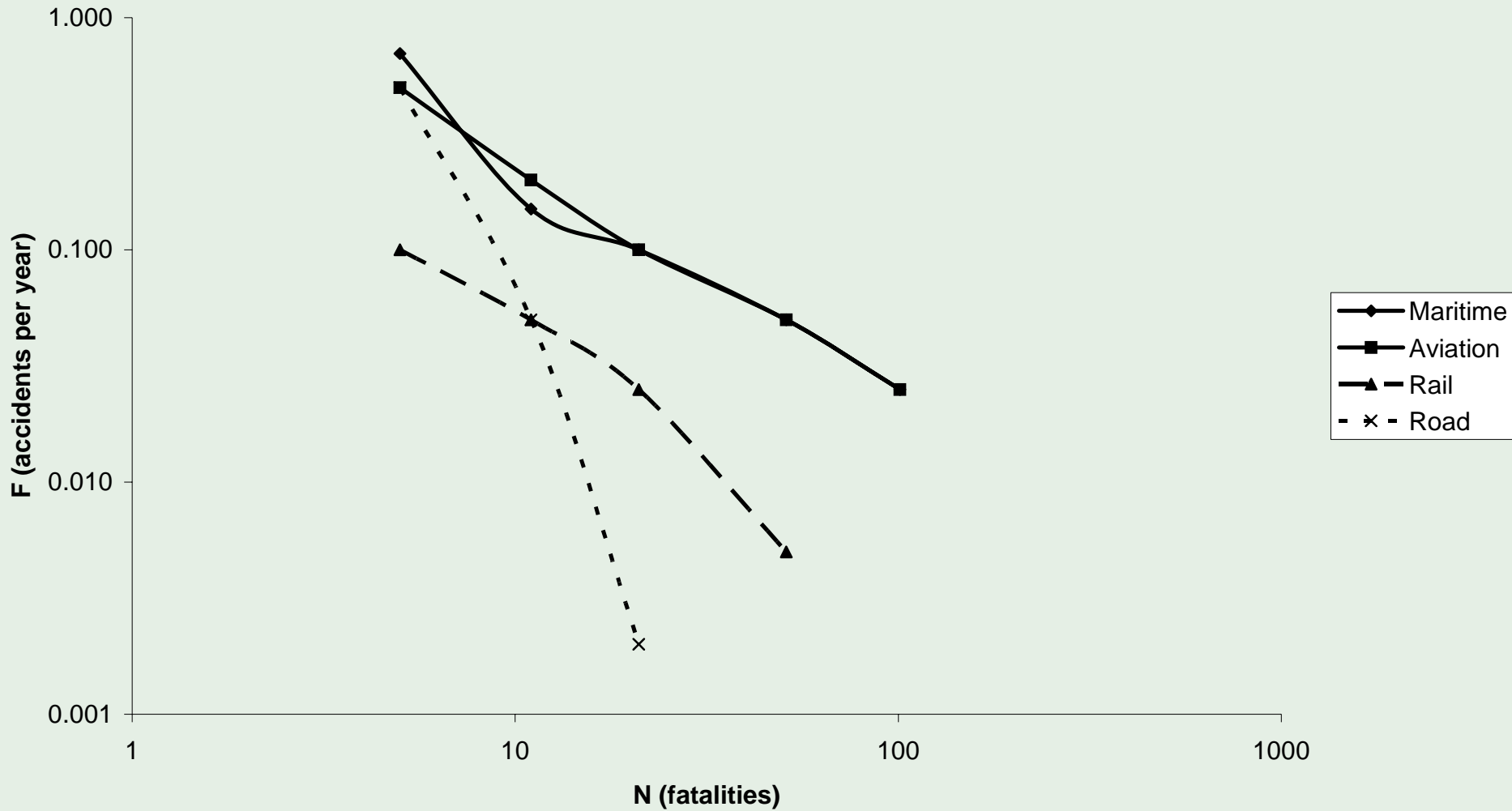
Some observations

- There is a trend for fatalities to decline in all modes of transport
- The occurrence of a major accident does not signal that safety has deteriorated
- The contribution of major accidents to total fatalities differs substantially between modes of transport

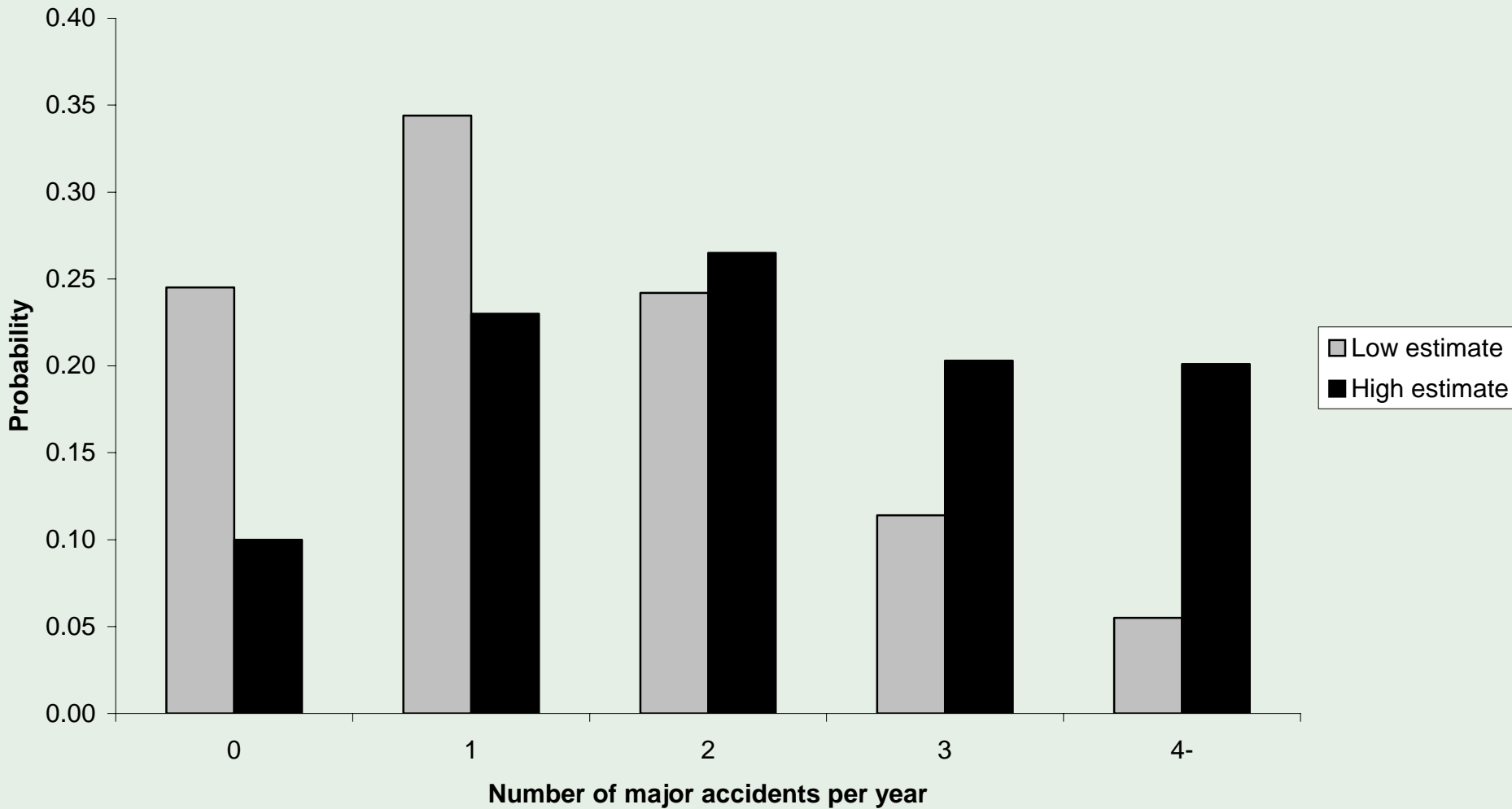
Observed and estimated long-term frequency of major transport accidents in Norway



FN-curves for long-term frequency of major transport accidents in Norway



Probability of 0, 1 etc major accidents per year - low and high estimate



Conflicting policy objectives

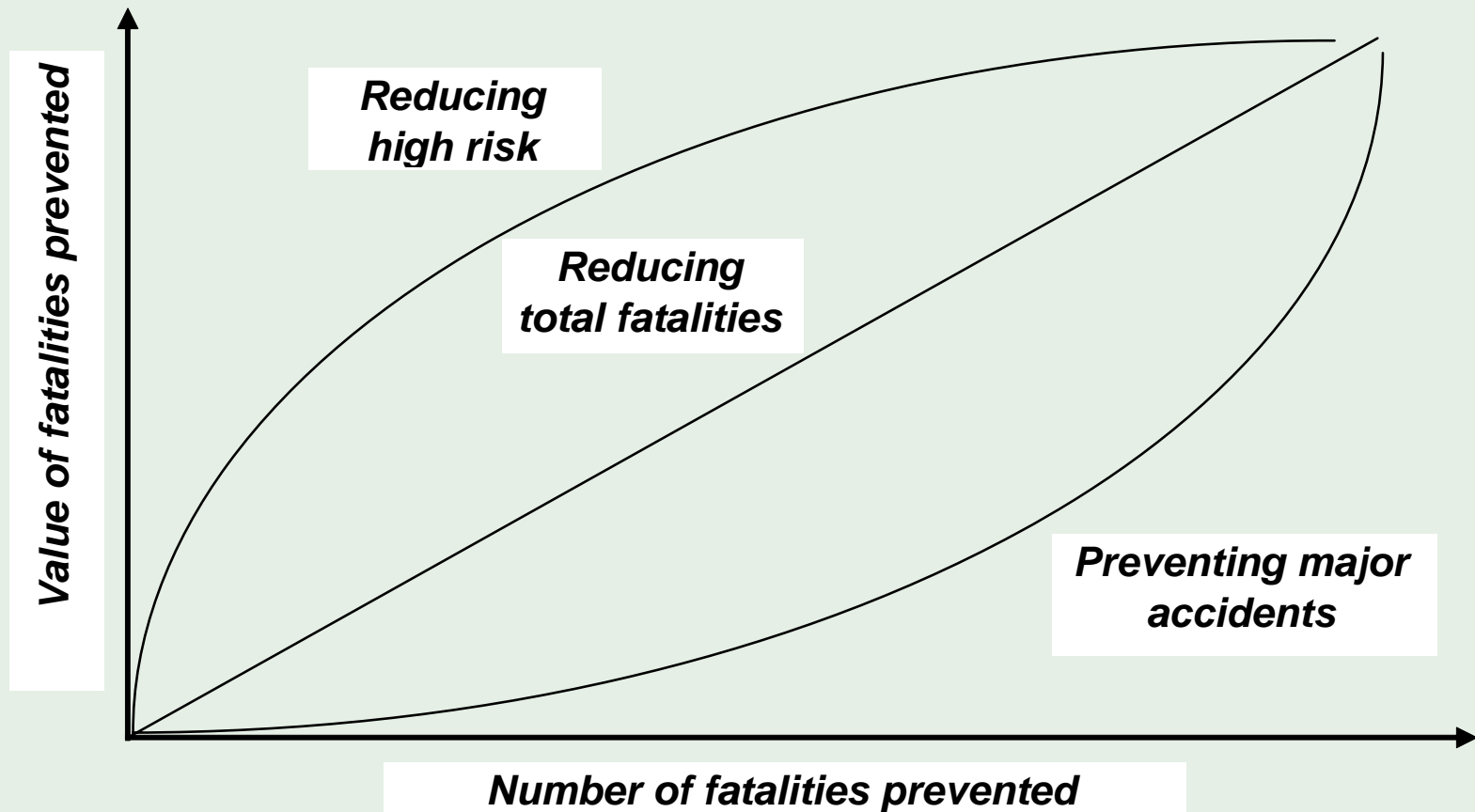
- Maximum reduction of total fatalities
- Reducing differences in accident risk
- Reducing likelihood of major accidents

- These policy objectives cannot be reconciled by assigning monetary values to them

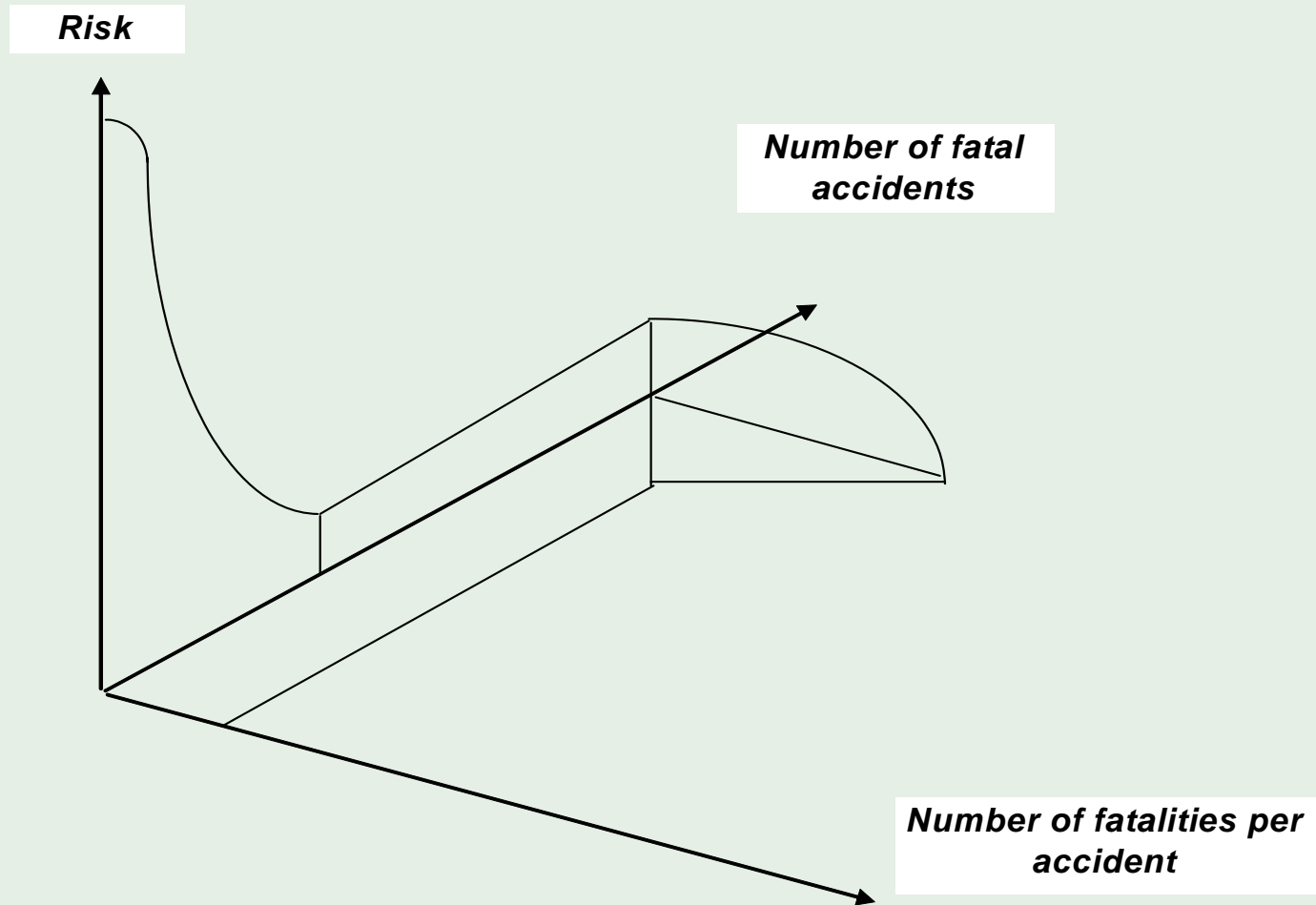
Implications of policy objectives

- Reducing total number of fatalities
 - All fatalities prevented are valued the same
- Reducing differences in risk
 - Preventing fatalities resulting from high risk is valued more highly than preventing fatalities resulting from low risk
- Reducing likelihood of major accidents
 - Preventing several fatalities in one accident is valued more highly than preventing the same number of fatalities in single-fatality accidents

Utility functions for policy objectives



A three dimensional representation



A multi attribute utility model

1. (Utility weight for objective 1) x
(Outcome indicator for objective 1) +
2. (Utility weight for objective 2) x
(Outcome indicator for objective 2) +
3. (Utility weight for objective 3) x
(Outcome indicator for objective 3) =
Total utility for all objectives

An illustration for road transport

- Utility weight = attributable risk
 - All fatalities (objective 1) = 1.000
 - High risk fatalities (objective 2) = 0.340
 - Major accident fatalities (objective 3) = 0.013
- Outcome indicator = value of dimension
 - All fatalities (objective 1) = 1.0
 - High risk fatalities (objective 2) = 5.5
 - Major accident fatalities (objective 3) = 6.4

Total maximum utility (road)

- Overall attainable utility:
 - $(1 \times 1) + (0.340 \times 5.5) + (0.013 \times 6.4) = 2.95$
- Contributions of objectives to overall utility:
 - Reducing total fatalities $1.00/2.95 = 34\%$
 - Reducing differences in risk $1.87/2.95 = 63\%$
 - Reducing major accidents $0.08/2.95 = 3\%$

Discussion of the utility model

- The utility values are arbitrary
- The utility function involves double counting
- The utility model does not tell when benefits are greater than costs

- The utility model is very flexible and can incorporate all policy objectives

Conclusions

- The long term frequency of major transport accidents is very imperfectly known
- Major accidents occur at random, but are becoming less frequent
- The importance of preventing major accidents cannot be addressed by means of cost-benefit analysis