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D-92-1
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Leidschendam, 1992
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STRATEGIES FOR IMPROVING ROAD SAFETY IN THE NETHERLANDS: PAST AND FUTURE

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This paper deals with the following subjects: how road safety in the Netherlands has developed in recent decades; how policy has contributed to this; and how one intends to continue improving safety in the future via policy and research.

Developments 1950-1990

The first diagram shows the development in the number of road deaths in the Netherlands since 1950 (Oppe, 1991). In that year, over 1000 people died on the road. During the peak year, 1972, this figure was over 3200, while today it has dropped back to 1300.

The number of road deaths represents the outcome of two factors: mobility and fatality risk (i.e. the probability of being killed while travelling from A to B). The first factor can be expressed as the number of vehicle kilometres travelled in a year; the second can be expressed as the number of deaths recorded per kilometre travelled in a year.

The second diagram shows the development in the number of vehicle kilometres since 1950. The mobility demonstrates a slow increase initially, followed by a rapid growth and finally tapering off to a less steep growth towards a saturation point.

The third diagram shows the probability of being killed in a road accident. The figures in this diagram were obtained by dividing the number of road deaths from the first group by the number of vehicle kilometres from the second group. In other words, it depicts the number of deaths per kilometre travelled. This death rate is declining steadily, and increasingly slowly: it is approaching a threshold value, which may be the horizontal axis, that is, nil deaths per kilometre. In these decades, the death rate dropped over 6% each year.

This analysis teaches us several things.
The fairly obvious observation that greater mobility leads to more road hazard is once again confirmed. What is more important, however: this observation has been refined and described in terms of quantified relationships.
The key issue is that the death risk has declined steadily since 1950, at an annual rate of some 6%. In periods where the mobility rose at the same pace, the number of deaths remained the same. However, when mobility rose by more than 6%, the number of deaths in an absolute sense increased.

Contributing factors

The next question is why the death rate has dropped to this degree in the Netherlands. To answer this, it is first necessary to make a comparison with a number of other, industrialised countries.

The fourth diagram shows that the Netherlands is not unique: all these other countries, the United States, Great Britain and Germany (i.e. the former West Germany) show a descending risk curve. A common explanation for this phenomenon is that people are increasingly able to deal with traffic as it becomes integrated into their society for a longer period. This view therefore sees the curve as a reflection of a learning process, so that it is sometimes referred to as the "learning curve".
This also explains why in the 1950s, the United States was already at a much lower risk level than the European countries. Here, mass motoring had already been an established fact for many years.
Better handling of traffic not only depends on the behaviour of individual road users, but also on the design of the traffic and transport system. For example, cars introduced onto the market started to offer greater crash safety to passengers (cage construction etc.). Special roads were built to carry traffic over longer distances.

The descending risk curve can be attributed to the safety-policy conducted in the Netherlands at the time. A number of measures were taken in recent decades for which research has subsequently demonstrated that they have clearly contributed towards improving road safety in the Netherlands.

In the first place, the infrastructure was adapted at several essential points. A national network of high standard motorways was built, on which the largest proportion of vehicle kilometres is travelled at very low risk. For residential areas, the so called "woonerf" was developed, and later the 30 km zone; these have been implemented to an increasing degree by municipalities who bear responsibility for administering this part of the national road system. Both inside and outside built up areas, many cycle paths have been built.
In the second place, a number of legal rules for road users has been laid down. Where voluntary compliance is less than satisfactory, the law is increasingly upheld by the police at a municipal level; this is often supported by nationwide or local information campaigns by the Dutch Road Safety Association (Veilig Verkeer Nederland, member of La Prevention Routiere Internationale). This was in any case successful in recent years by cutting back on drinking and driving. The wearing of front seat belts increased immediately, but not sufficiently, after their use was made compulsory although hardly any control has been executed; in the last decade, the police has devoted more attention to this rule and the wearing rates increased slowly. The obligation to wear a helmet, particularly for moped riders, was hardly controlled, but that was not really necessary, particularly during the first few years.

In addition, a number of favourable conditions have been met that are not attributable to a concrete measure, but have come into being over time, partly under the influence of some government intervention. For example, the lower order of road network is reasonably designed and maintained; the cars are well kept; the driving education system is reasonably professional.

Future developments

The fifth diagram sketches the developments anticipated in the coming years up to 2010, where 1986 has been chosen as point of departure (Janssen, 1988).
Three variants are depicted: an optimistic, a pessimistic and a mean variant. The graph assumes a certain degree of growth in traffic for various parts of the road network, representing in total a 60% increase in the

number of vehicle kilometres. The optimistic variant is calculated on the assumption that the death rate will drop at about the same rate as in the past, i.e. some 6% per year. The pessimistic variant is based on the assumption that the risk in 2010 is equivalent to that of 1985. The mean variant is based on death rates for 2010 that lie exactly between the values of the optimistic and pessimistic variants.

It is clear that only the optimistic variant shows a substantial decrease in the number of deaths in 2010 compared with 1986, i.e. from 1529 to 587. The mean variant matches the same order of magnitude as for 1986 (1400), while the pessimistic variant is almost double the value (2556). That is why it is good to consider under what conditions the optimistic variant has a chance of being realised.
It is a misconception to think that the unvarying drop in the death rate is achieved by doing "nothing special". As already said, this steady drop was achieved in the past thanks to the numerous measures which were constantly introduced. This means that policy in future will have to make similar efforts to bring such an effect about. The question then of course is what these measures should consist of. This is not so easy, because the conviction is growing that although current safety measures may be further optimised in the short term, there will be an increasing drop in return, so that the intended, large drop in the number of fatalities will not be attained in the longer term.
Further, one should take into account another threat to successful safety policy: the rapid growth in mobility.

The prognosis for the number of deaths in 2010 made the assumption that there would be a 60% growth in vehicle kilometres approximately with respect to 1986, ie. 2 to 3% per year. This seemed a conservative estimate at the time, since this could be expected with an unaltered mobility policy, while official policy aimed for a significant decrease in growth. However, in the first years after 1986, a much more rapid growth was seen, namely on average over 5%. A more recent prognosis for mobility growth if policy remains constant therefore estimates an increase of 72% in vehicle kilometres in 2010 with respect to 1986.

A more rapid growth in mobility than the previously assumed 60% can influence the number of deaths unfavourably in two ways.
In the first place, because given a certain fatality rate, the product of mobility and risk - i.e. the number of deaths - will increase. In addition, a marked increase in mobility in the Netherlands can mean that the fatality rate will develop differently than has been seen in all countries to date, and will no longer drop; rather, it will remain constant or even increase. Recent developments in another country where mobility is also close to saturation point, i.e. Japan, showed that this is no theoretical pie in the sky (Oppe, 1991).
Of course, given a certain number of vehicle kilometres, an increase in the death rate also translates into an increasing number of road accident victims.

From this, the conclusion can be drawn that any road safety policy in the Netherlands can only lead to a decrease in the absolute number of deaths, when a powerful and effective brake is put on the growth in mobility. Fortunately, government policy in the Netherlands was recently reviewed and a choice was made for a new set of measures that should result in "only" a 48% growth in the number of vehicle kilometres in 2010 with respect to 1986. In addition, the government has said it will attempt to further cut back growth to 35%. This is approximately half the growth rate if policy

were to remain unchanged, and - most notably - a quarter of the growth seen in recent years. Clearly, the government has set itself a very ambitious task.

Future policy

Since 1985, the Dutch government has adopted a so-called Long Term Plan for Road Safety, that is updated every two years. This plan formulated a quantitative task of 25% fewer road accident victims in 2000 than in 1985. Later, minus 40% in 2010 was added to this aim. From the outset, a limited number of so-called policy spearheads have represented the key issues: alcohol, belts and helmets, speeds, black spots and inexperienced road users. Several other subjects were added to these over the years, such as daytime running lights and heavy traffic.

When the Third Long Term Plan for Road Safety was drawn up in 1991, it was noted that if the policy conducted to date was continued, the task set would probably not be
reached, also due to the anticipated developments in mobility. On the one hand, it was concluded than the spearhead policy had borne fruit; nevertheless, it was thought there was still room for improvement. On the other hand, another viewpoint gaining in popularity was that policy had an inadequate grasp on structural factors in the traffic and transport systems which determine road hazard: road design, vehicle construction and the knowledge, attitudes and skills of the road user.

An example based on the policy spearhead of speed reduction forms a good illustration of this. Police controls can certainly lower speeds on a dangerous road, thereby enhancing safety. However, this can be thought of as a way to combat the symptoms, not the disease. People drive too fast because mistakes have been made in designing the road system comprising the factors road-vehicle-man: the road invites high driving speeds, the vehicle is built for speed and the driver has not been trained to choose a speed to suit the situation.

As a result, the designers of the Third Long Term Plan for Road Safety have come to the conclusion that - aside from intensification of spearhead policy - more must be done to ensure that the tasks for 2000 and 2010 are attained.
Safety must be built into the structure of traffic and transport systems, and become a sustainable quality characteristic of the traffic system itself.
The actual plan offers an initial impetus for policy in this direction. Concrete campaigns are announced affecting matters such as the design of residential areas, speed-limiters for lorries and the preparation of educational material on traffic and transport for secondary students. In addition, further plans have been announced, also for structural solutions to road hazards on two lane rural roads and in urban areas. This is all taking place in close collaboration with provincial and municipal government, because they bear responsibility for the majority of these measures.

At about the same time, SWOV, together with a number of research institutes, was asked by the Ministry of Transport and Public Works to develop a concept along which the existing traffic system can evolve towards a sustainable safe system. Parts of this concept are being worked out at present.

The proposals concern safe control of mobility, measures affecting the infrastructure, vehicles and road users and the improved organisation of medical care for victims.
It is expected that in the long run, this fundamental innovative approach can result in 90% fewer casualties.

An example

The following illustration offers an impression of the nature of the proposals. This example relates to the road infrastructure and influencing behaviour, and concerns the problems of road hazard on two lane rural roads: how should these be designed, and how can people be taught to behave correctly. A general problem on these roads in the Netherlands is that road users are confronted at unexpected moments with numerous variations in road design. Meanwhile, the same rules, such as the speed limit, still apply. Because of this confusion, it is not clear what behaviour is expected of road users and what they can expect from others. This leads amongst other things to many infringements of the rules, great variations in speed, taking insufficient notice of slow traffic and - ultimately - many and serious accidents.
Solutions to these problems must start with a clear classification of roads, which is also recognisable to road users on the basis of road design. For example, a distinction should in any case be made between roads intended for fast through traffic and roads that function as residential street for adjoining houses. Each category must have a set of rules associated with it. The transition from one category to another must be clearly marked. In this way, the road user is better able to predict the course of the road, and knows what behaviour is expected of himself and others. The rules will be better complied with, and less variation in speeds will be the result.

A physical reorganisation of the road network is not sufficient, however, to solve the road hazard problem on these roads. Aside from information campaigns about the new categories and the associated rules, people will have to learn how to behave correctly. If this is to lead to a lasting change in behaviour, they will have to be equipped with the correct knowledge, skills and attitudes.

In the first place, they must adapt their behaviour to restrictions imposed by the road design and by other road users. On a road which fulfills a residential function, it is necessary to take into account children crossing unexpectedly; therefore, speeds must never exceed 30 km/hr.
Secondly, road users must learn to make sensible use of possibilities available to them within the recently stated restrictions. On a road for fast through traffic, people will also meet slower traffic which has just inserted into the traffic stream, for example. When approaching such a slowly driving car, people should therefore anticipate and decrease their own speed in time. Or - to give another example - when it is raining, people should themselves adopt a lower maximum speed than the legal limit.

This example relates to teaching complex skills to drivers of motor vehicles, supported by the correct knowledge and attitudes. This presupposes in the first place that people are prepared to change behavior and to learn different ways of dealing with traffic. Aside from forming and education, this also demands training under practical conditions. In the Netherlands, current driving schools offer good opportunities for this, albeit that certain improvements are still required. One limitation is that such training will only reach the influx of new drivers.

Conclusion

One main lesson can be learned by other countries from these Dutch experiences, especially by those countries who are at the beginning of the process of mass-motorisation that the Netherlands has gone through since the fifties. The growth of traffic and transport is directly related to the social and economic development of a country. Therefore in these countries the governments probably give priority to stimulating the growth of mobility in stead of putting a brake on it. As a consequence one can expect an increase in fatalities like in the fifties and sixties in the Netherlands. However, the extent of increase can be controled by taking effective safety measures.
One has the unique opportunity to avoid some big mistakes that have been made in the Netherlands, like in the other western countries. The first is that the government did not anticipate timely at the growth of traffic; therefore motorways and circular roads around cities and villages were built too late. Although building new roads is very costly, postponing it doesn't make it cheaper. The second mistake was that the government did not pay enough attention to the safety aspects of the new road-network. Now one is trying to rectify these mistakes by introducing the concept of sustainable safety. Moreover, one should realise that "building safety into" the road-network right-away costs almost nothing extra; it is much more expensive to reconstruct the roads afterwards.
A good example is one of the leading principles of sustainable safe: a consequent classification of road categories. This can easily be realised when developing a new network and is very hard to change later on.

Literature

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Deaths 1950-1990 the Netherlands

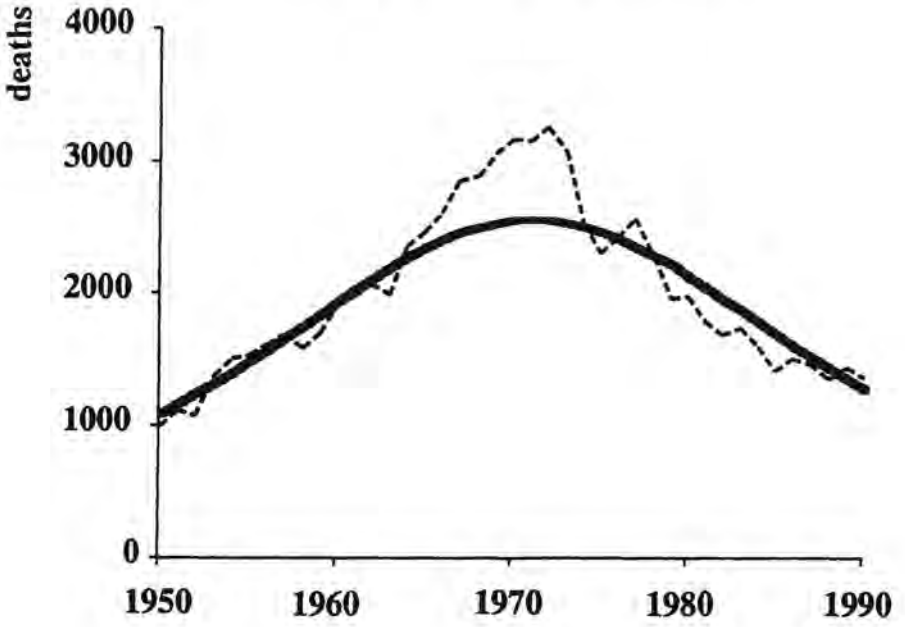

Diagram 1

Vehicle km's 1950-1990 the Netherlands

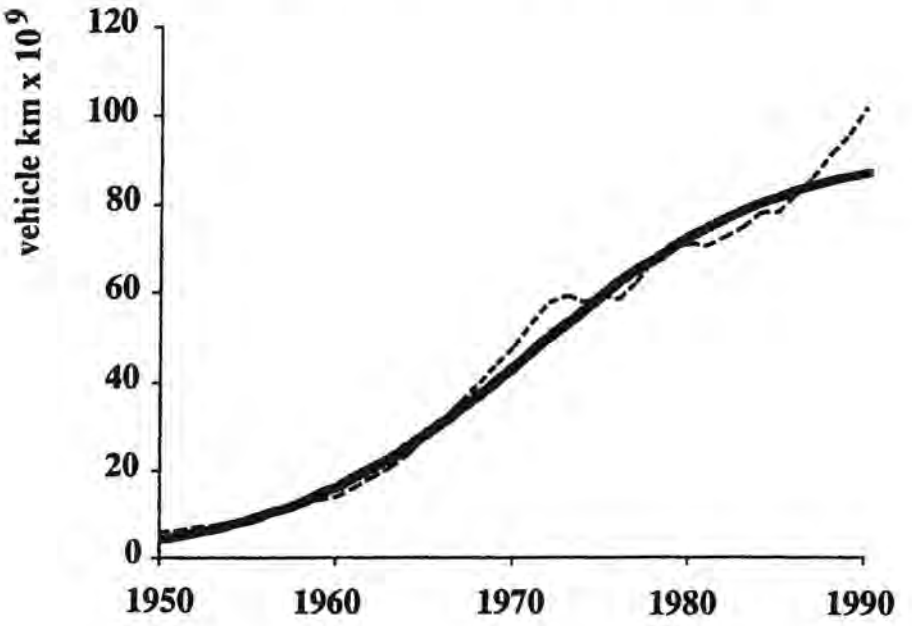

Diagram 2

Death rates 1950-1990 the Netherlands

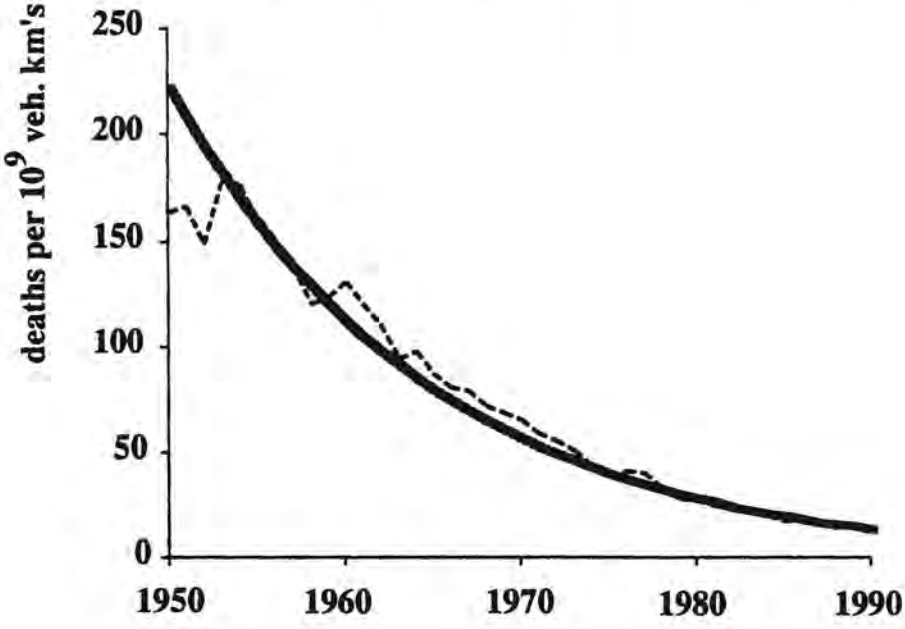

Diagram 3

Death rates 1940-1985

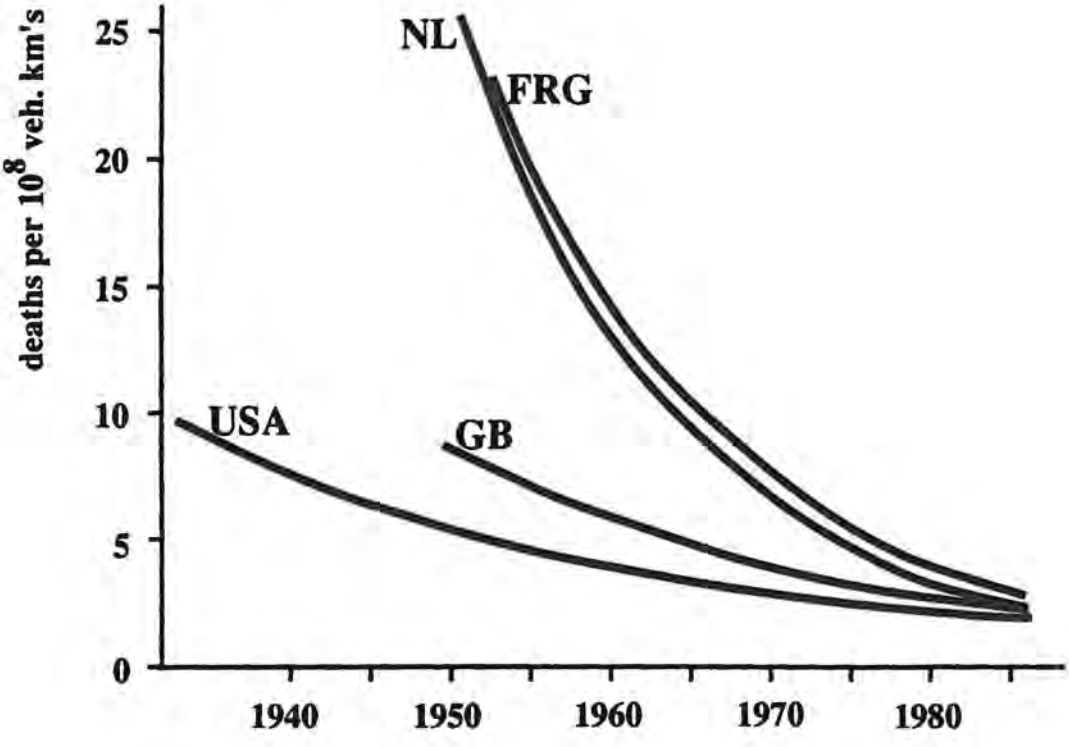

Diagram 4

Prognosis deaths 2010 the Netherlands

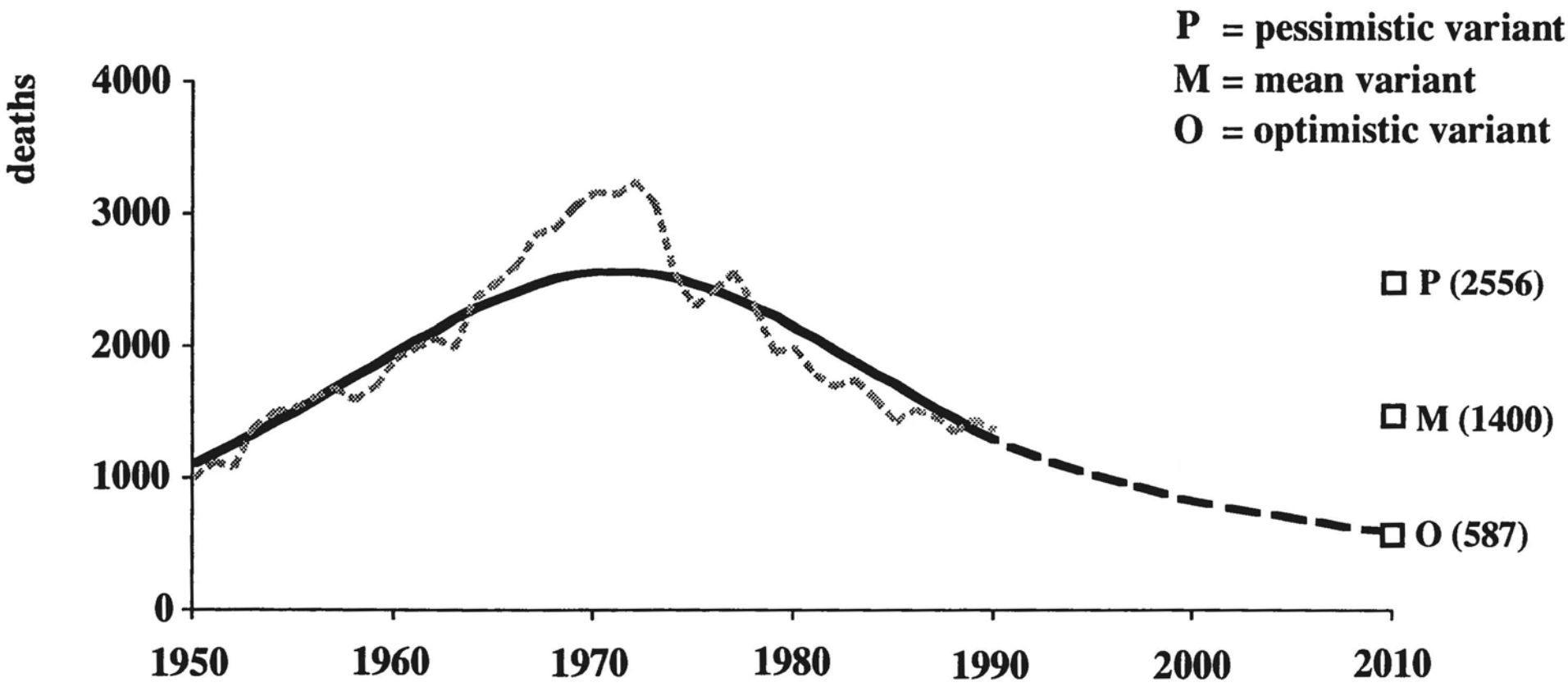

Diagram 5