

# MORTALITY AND CAUSES OF DEATH DURING TWO MAJOR ECONOMIC RECESSIONS: THE NETHERLANDS 1915-1984

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## SUMMARY

*This chapter presents an analysis of the mortality effects of two major economic recessions in the Netherlands, those of the 1930s and 1970/1980s respectively. Mortality trends during the 1930s were generally very favorable and do not suggest that the Great Depression had important mortality effects. Mortality trends during the 1970s and early 1980s were favorable too, and generally no less favorable in regions with a larger rise in unemployment.*

## 1 INTRODUCTION

The view that economic development and its effect on living standards are key factors in the explanation of mortality patterns is one of the central paradigms of the discipline of public health/social medicine. This view is illustrated, for example, by the work of Thomas McKeown, who argued that the main factor behind the dramatic decline of mortality in England and Wales since the eighteenth and nineteenth centuries was a rise in living standards, particularly in the form of increases in food consumption (McKeown, 1976).

Given this type of explanation for long-term trends in mortality the question arises whether short-term fluctuations in economic development also affect mortality patterns. This question is dealt with extensively in the work of Harvey Brenner who, on the basis of time-series analyses for England and Wales and several other countries, argued that "...economic recessions and subsequent periods of rapid economic growth are associated with a deceleration of the normally declining curve of mortality decline against time" (Brenner, 1979, 1983, 1987).

In this chapter we present the results of an analysis of the mortality effects of major economic recessions in the Netherlands. **Figure 1** shows the development over time in the Netherlands of one important indicator of economic recession, the unemployment level. The first year for which data on unemployment are available is 1930, and data are lacking for 1940-1946. The time series shows that unemployment levels rose rapidly after the 'crash' of 1929. A peak was reached in 1936, after which a rapid decline set in. After the second World War unemployment levels were generally quite low, with temporary small increases in 1952, 1958 and 1967, marking minor recessions. After 1970, unemployment levels rose until 1976, declined slightly until 1979, and then rose to levels equalling those of the 1930s in 1983.

Although the focus of this chapter is on the mortality effects of the last economic recession in the 1970/1980s, we will also study the mortality effects of the earlier economic recession in the 1930s, in

order to place the more recent findings into perspective. We will restrict our attention to short term effects (say, within 2-4 years). We will not only study total mortality (all causes, all ages) but also mortality in specific age-groups and for specific causes of death, because some age-groups and some causes of death may be more susceptible to socioeconomic changes than others.

The results of the analyses will be presented in three sections:

- In a first section we will try to find evidence for an effect of the recession of the 1930s on mortality time trends in the Netherlands.
- In a second section we will try to find evidence for an effect of the recession of the 1970/1980s on mortality time trends in the Netherlands.
- In a third section we will expand our analysis of the mortality effects of the recession of the 1970/1980s by introducing a regional dimension. There have been large differences between various parts of the Netherlands in the rise in unemployment levels. We will inspect whether a more unfavorable trend in unemployment was associated with a more unfavorable trend in mortality during the 1970/1980s.

## 2 DATA AND METHODS

For the period 1915-1945 (intended to cover the periods before and after the economic recession of the 1930s) national mortality data by age and by cause of death were available from publications by the Netherlands Central Bureau of Statistics (CBS, 1970, 1984 and yearly publications). The mortality rates by cause of death were indirectly standardized for changes in the age- and sex-structure of the population, using average mortality rates by age and sex over the entire period as the standard rates.

For the period 1950-1984 (intended to cover the periods before and, to some extent, after the economic recession of the 1970/1980s) national mortality trends by cause of death were available in the form of loglinear regression estimates, calculated in the framework of another study (Mackenbach, Kunst, Looman et al., 1988). The regression analyses controlled for the effect of changes in the age- and sex-structure of the population. The original mortality data were supplied by the Netherlands Central Bureau of Statistics.

For the periods 1970-1974 and 1980-1984 regional mortality data by cause of death were available in a publication based upon this same study (Mackenbach, Kunst, Looman et al., 1988). First we calculated indirectly standardized mortality rates, using the national mortality rates by age and sex for both periods combined as the standard rates. Secondly we calculated the relative difference for each region between its mortality rates for both periods (expressed as a percentage of the rate for 1970-1974). The original mortality data were supplied by the Netherlands Central Bureau of Statistics.

Regional unemployment data, measured as the number of unemployed registered at Municipal Labour Offices per 1000 population 15-64 years, were available from several published sources (Bartels, 1977; CBS, 1982). Regional unemployment trends were measured as the absolute difference between October 1st, 1970 and October 1st, 1982. (A measure of absolute change was chosen instead of a measure of relative change, because unemployment levels in 1970 were very low relative to the following increase.)

Regional mortality trends were related to unemployment trends by means of ordinary (unweighted) least squares regression. Three regression models were fitted to the data:

- model 1, which did not include any control variables;
- model 2, which included the unemployment level in 1970 as well as 3 sociodemographic variables (log population density, average number of years of education and percentage population Roman-Catholic) as control variables;

- model 3, which included trends in the first 2 sociodemographic variables as control variables (percentage population Roman-Catholic is not available for the early 1980s).

### 3 RESULTS

#### 3.1 Trends in national mortality in the 1930s

Unemployment rates rose rapidly after the 'crash' of 1929, reaching peak levels in 1936, after which an equally rapid decline followed ([figure 1](#)).

Secular trends in unemployment rates in the Netherlands, 1930-1984

Mortality among infants and children, which has in other circumstances been shown to be quite sensitive to socioeconomic conditions, declined considerably faster in the 1930s than in the 1920s ([figure 2](#)).

Although mortality decline was slightly faster in the first half of the 1930s than in the second half, it continued in the second half, and 1939 had lower levels of infant and child mortality than had ever before been recorded in the Netherlands. Among adults and elderly people mortality trends in the 1930s were also at least as favorable as those in the 1920s.

[Figure 3](#) shows mortality trends for 3 causes of death which are particularly sensitive to socioeconomic conditions. Tuberculosis mortality showed a steady decline during the 1930s, which was considerably faster even than the decline during the previous decade.

The other two causes of death in [figure 3](#) were found to have increased during the 1930s in certain areas of England and Wales affected by high unemployment rates (for rheumatic fever see Morris & Titmuss (1944) and for maternal mortality see Winter (1983)). In both cases 1930 marked the beginning of mortality decline in the Netherlands, which may have been interrupted after 1937 for rheumatic fever but accelerated continuously for maternal mortality.

#### 3.2 Trends in national mortality in the 1970/1980s

[Figure 1](#) showed that after 1970 unemployment rates increased up to 1976, to a level slightly higher than in earlier minor recessions. From 1976 to 1979 there was a temporary decline, and from 1979 to 1983 a massive increase to levels equalling those of the 1930s.

In the younger age-groups, total mortality declined continuously between 1950 and 1984, without signs of interruption around or shortly after 1970 or 1980 ([figure 4](#)).

Mortality changes in older age-groups are smaller and follow a more complicated pattern. During the 1970s and early 1980s the trends were no more unfavorable than before. For the age-group 45-64 years 1970 was even a turning-point in the sense that an increase in mortality ended and a decrease started.

When we look at specific causes of death ([scheme 7](#)), trends during 1969-1984 are frequently more favorable than those during 1950-1968. The only exceptions are 'other heart disease' and influenza/pneumonia (in females only). On the other hand, both ischemic heart disease and traffic accidents show a dramatic reversal from rising mortality in the first, towards declining mortality in the second sub-period.

Trends during the years 1980-84 are slightly less favorable than those during the complete period 1969-1984. Diseases of arteries (atherosclerosis) and chronic obstructive pulmonary disease are the most outspoken examples.

### 3.3 Regional variation in development of mortality and unemployment between 1970-1974 and 1980-1984

**Figure 5** shows that there was considerable geographic heterogeneity in the evolution of unemployment rates in the Netherlands, with regions in the eastern parts of the country more severely afflicted.

The results of the regression analysis of regional mortality trends on unemployment trends are presented in **scheme 8**. If unemployment did cause higher mortality rates, one would expect positive signs in the regression coefficients.

For total mortality there is no statistically significant association between mortality trends and unemployment trends. This applies to all three regression models (i.e. either with or without control for potential confounding variables).

For specific causes of death, only a small number of statistically significant relationships have been found. Without control for potentially confounding variables positive associations between mortality and unemployment, trends are found for cerebrovascular disease, cancer of colon and non-traffic accidents, whereas a negative association is found for traffic accidents.

With the second regression model, which controls for the levels of unemployment and three potential confounding variables in 1970, no statistically significant associations are found. On the other hand, with the third regression model, which controls for changes in two potentially confounding variables, the same results are obtained as with the first model.

Because the effects of unemployment on mortality might be expected to be larger among males than among females, we repeated these regression analyses with mortality data for males (**scheme 9**).

Again, no statistically significant associations are found for total mortality. For specific causes of death, only two statistically significant associations are found, a positive one for cancer of colon and a negative one for traffic accidents.

## 4 DISCUSSION

In this chapter we addressed the question of whether two major economic recessions, characterized by high unemployment levels, were accompanied by unfavorable mortality trends.

Mortality trends during the 1930s, a period with a much more devastating economic crisis than that of the 1970/1980s, suggest that the Great Depression did not have considerable mortality effects. This does not increase the plausibility of such effects during the more recent 'crisis'.

Although it is too early to know whether the recession of the 1970/ 1980s will ultimately affect mortality, mortality trends in the 1970s and early 1980s were favorable, and suggest that there were no strong harmful effects so far. The only large causes of death which clearly showed unfavorable mortality trends during the early 1980s are diseases of the arteries and chronic obstructive pulmonary disease.

The search for associations between changes in unemployment and changes in mortality at the regional level showed that total mortality did not decline less in regions with a larger rise in unemployment. For cerebrovascular disease, cancer of colon, and non-traffic accidents, however, there was some evidence of less favorable mortality trends in regions which experienced a steeper increase in unemployment rates.

The evidence is weak, because the associations largely disappeared when the analysis controlled for a number of possible confounding variables (including unemployment rates in the early 1970s), and when the analysis was repeated for males only.

A comparison with other studies dealing with the effect of unemployment on specific causes of death does not lend much support to the suggestion that our associations are more than just spurious. A study on the individual level from England and Wales, using data from the OPCS Longitudinal Study, showed that men seeking work in 1971 had higher mortality rates during 1971-1981 for suicide, lung cancer and ischemic heart disease (Moser, Fox and Jones, 1984). These findings were confirmed by an analysis of mortality during 1981-1983 of those seeking work in 1981 (Moser, Goldblatt, Fox et al., 1987). Another study from England and Wales compared cause-specific mortality trends in 1975-1983 between regions with different unemployment trends, and found slightly (but not statistically significantly) worse mortality trends in regions with greater unemployment increases for suicide, ischemic heart disease and cerebrovascular disease in men (Charlton, Bauer, Thakhore et al., 1987). We did not study suicide, but for ischemic heart disease, the other common finding of both studies from England and Wales, we did not find less favorable mortality trends in regions with a larger rise in unemployment. Of our findings, only the one on cerebrovascular disease corresponds to the results of at least one of the English studies.

Not only is the Dutch evidence of adverse mortality effects of a rise in unemployment weak, there may even have been favorable effects. The most notable case is traffic accident mortality, for which a decline started shortly after 1970. This decline was faster in regions with a larger rise in unemployment.

As shown in [figure 6](#), the onset of mortality decline (for motor-car passengers, the largest subcategory of traffic accident casualties) was partly related to a change in the trend of the 'exposure' to accident risks, i.e. the number of kilometers travelled (Van Beeck and Mackenbach, 1988). This change in passenger car use was caused by the economic recession.

It should be noted at this point that, as was stated in the introduction, we have only tried to identify short term effects. For the economic recession of the 1930s it was impossible to identify long term effects because of the effect on mortality of the Second World War. For the economic recession of the 1970/1980s, especially for the more severe 'unemployment crisis' of the early 1980s, it was impossible to identify long term effects because our mortality time series did not reach beyond 1984.

A second limitation of our analyses at the national level is, that simple inspection of mortality curves can only identify abrupt effects, which, in addition, are large enough to become visible even without control for other determinants of mortality change.

A comparison with Harvey Brenner's analyses reported in chapters 10 and 12 of this volume, as well as in the international literature (Brenner, 1979, 1983, 1987), shows that his work does not suffer from this second limitation. The time series models which he applies permit the measurement of gradual effects, and control for the influence of at least some other factors. His results suggest that an increase in unemployment rates did have a lagged effect on mortality rates in the Netherlands as well as in other countries in the period 1950-1985, after controlling for a number of economic variables and a number of epidemiologic risk factors (chapter 12). This effect of unemployment appears to be distributed over a period of 0-15 years and, given the mortality time series used, must thus mainly be related to economic fluctuations before the unemployment crisis of the early 1980s.

Superior as it may seem, Brenner's work has been severely criticized from a methodological point of view (Gravelle, Hutchinson and Stern, 1981 and Wagstaff, 1985). A detailed critique of his materials and methods is outside the scope of this chapter, but some questions can at least be raised.

For each country, the number of observations on which Brenner's analysis is based, is essentially (and unavoidably) small. The unemployment time series covers the period 1950-1985, and a number of years before 1950 in order to allow for lagged effects. In this period only a limited number of economic

fluctuations has occurred, say 6, exhibiting a more or less regular pattern. Under these circumstances it is very easy for the unemployment variable to pick up the effects of any other variable, especially if this has a more or less similar time structure, e.g. influenza epidemics or a couple of 'waves' of improvements in medical care.

As the number of observations on mortality is also rather small, at least in relation to the number of explanatory variables (some 35 observations on mortality which have to be explained from ca. 6-10 independent variables), it is not very surprising that the fit of Brenner's models is rather tight. This is the more so because lagged effects are allowed with very few constraints on the length of the lags and the form of the lagged effects. It is important to note that the correspondence between observed mortality rates and mortality rates predicted by the model is no proof at all that the association between one of the predictor variables, unemployment, and mortality reflects a causal relationship. Furthermore, although the 'direction' of the association between unemployment and mortality is the same in all countries, the values of the coefficients differ dramatically.

In any case, we will have to wait another couple of years before we can see whether a Brenner-type analysis reveals long-term mortality effects of the unemployment crisis of the early 1980s. We conclude from our analysis that there is no clear evidence for short-term effects.

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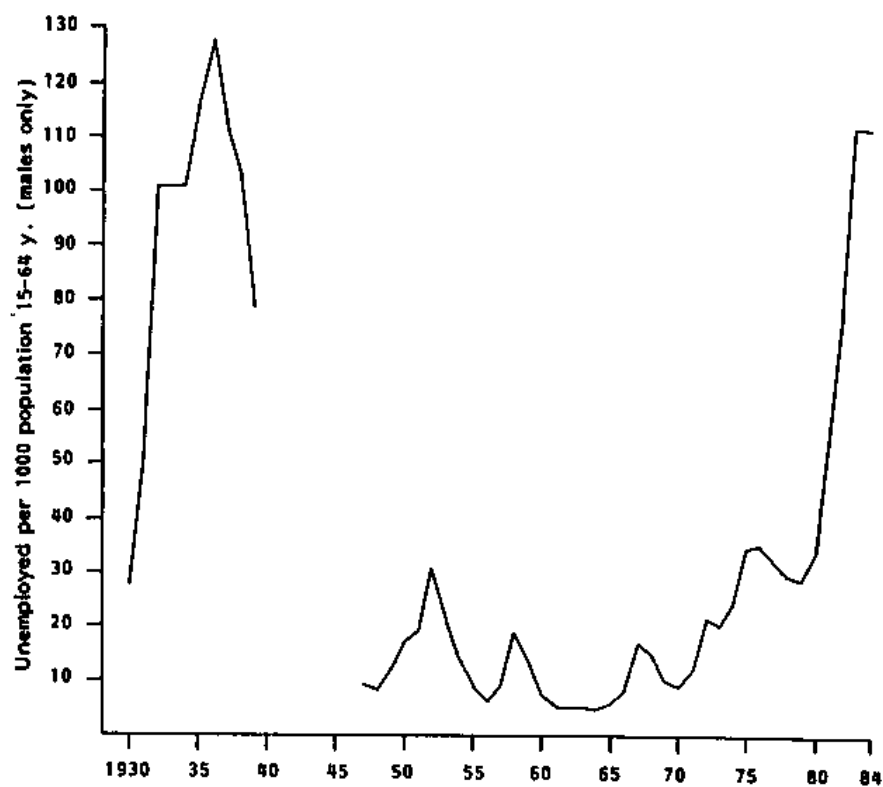
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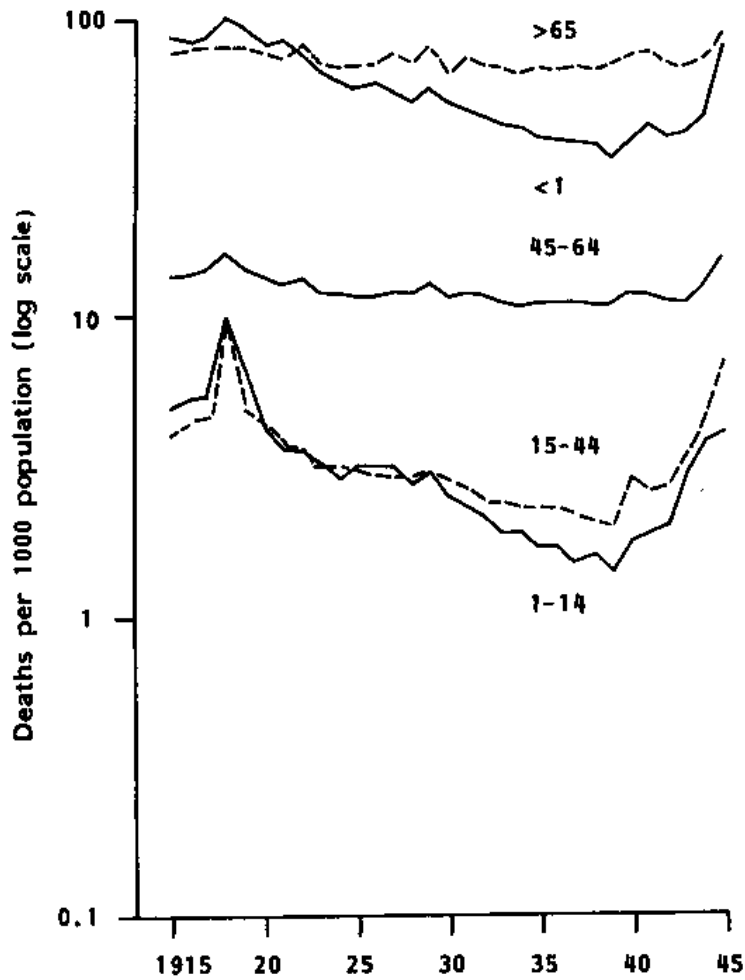


**FIGURE 1**  
**Secular trends in unemployment rates in the Netherlands, 1930-1984**



Registered male unemployed, excluding those on supplementary works etc.

**FIGURE 2**  
Trends in age-specific mortality rates in the Netherlands, 1915-1945

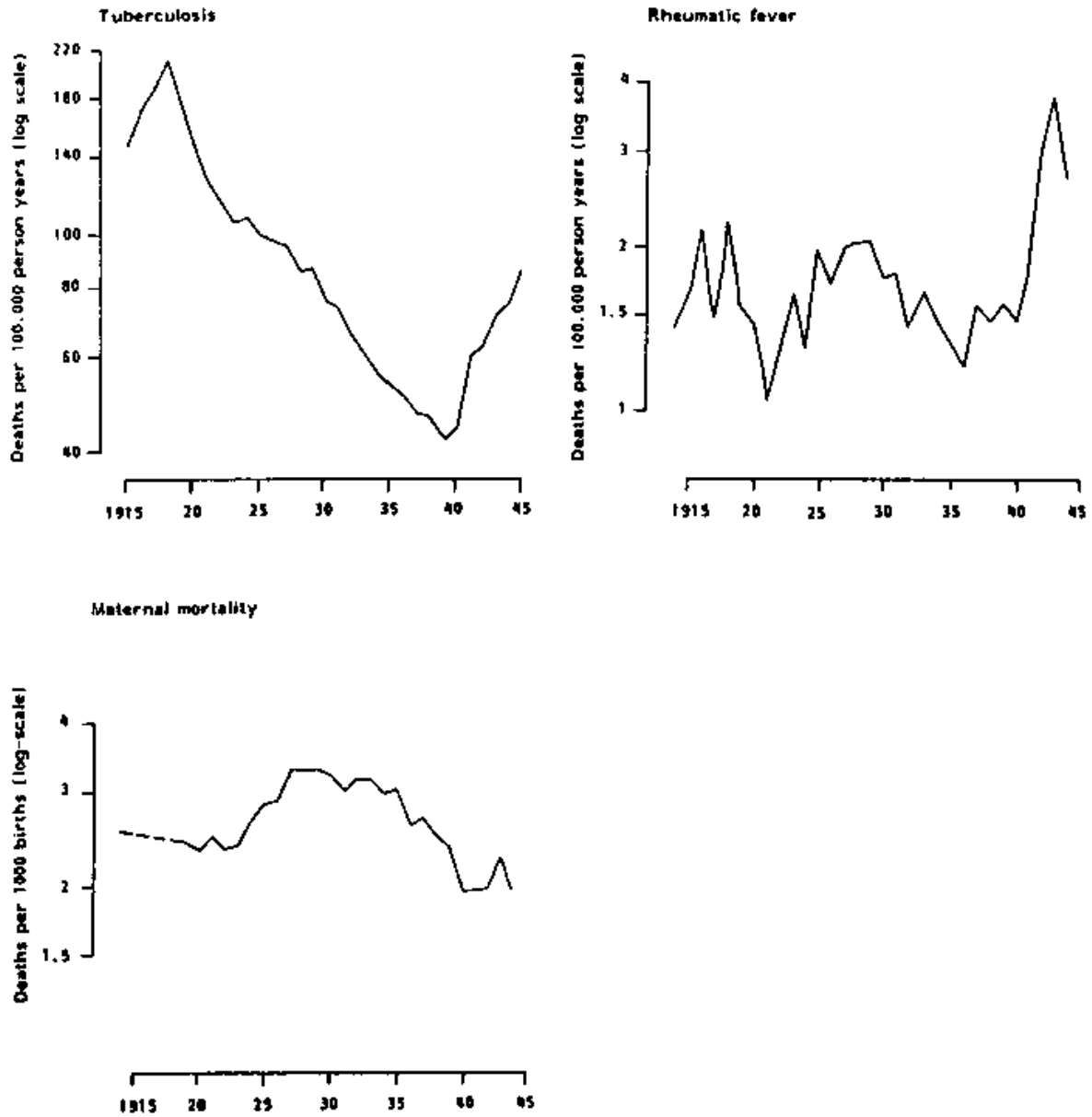


Deaths per 1000 population; infant mortality per 1000 live-born.

Source: CBS

**FIGURE 3**

**Trends in mortality from selected causes of death, the Netherlands, 1915-1945**

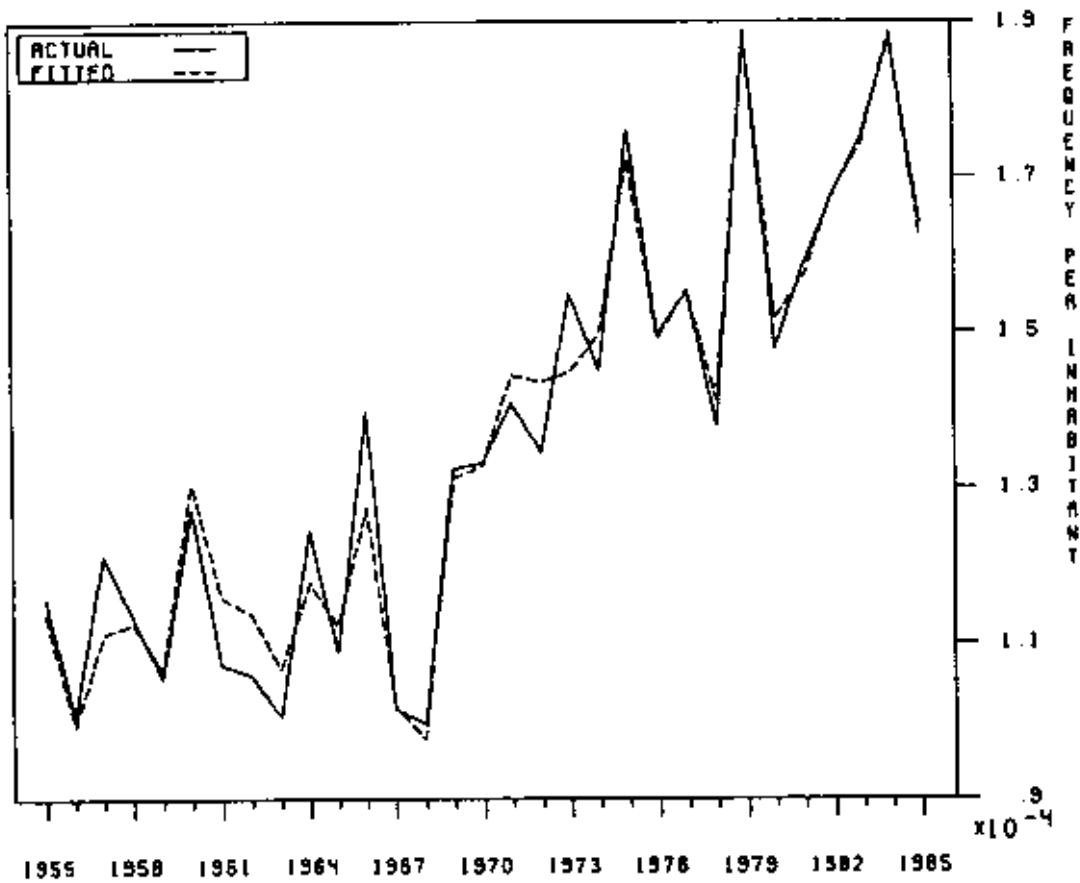


Mortality rates per 100,000 person-years, indirectly standardized for changes in age-/sex-composition of the population.

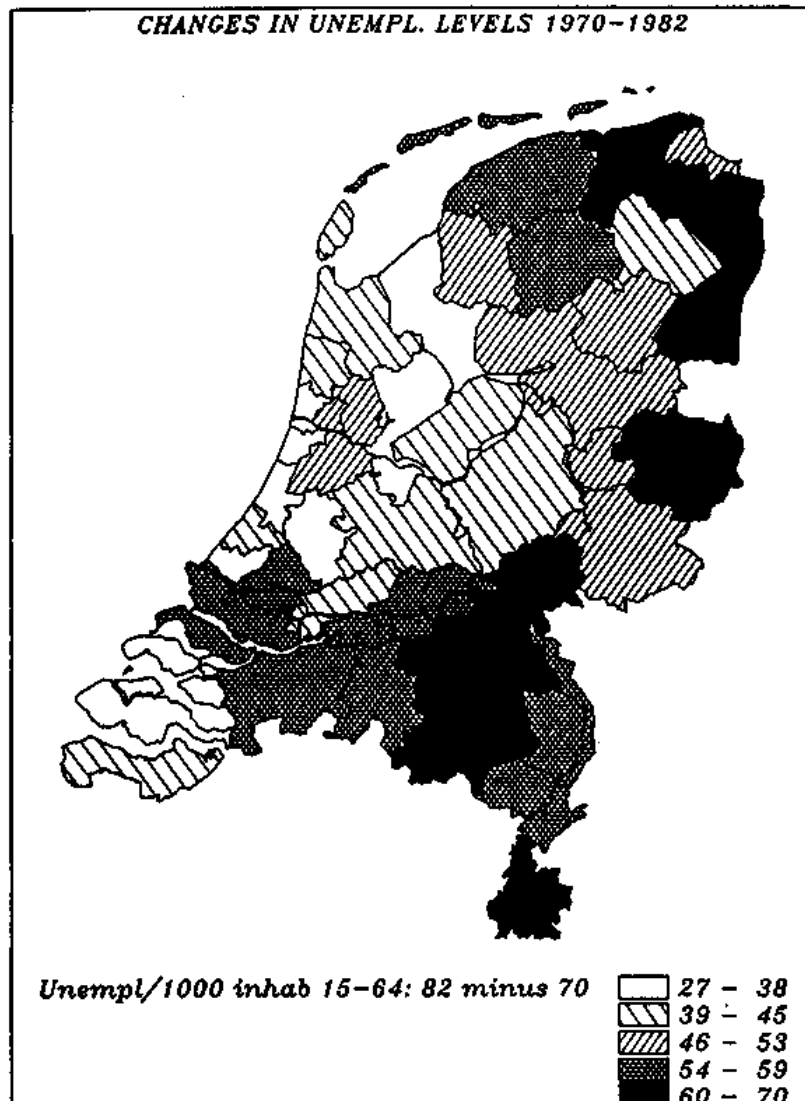
Source: CBS

**FIGURE 4**  
**Suicide rate and fit of model (table 9)**  
**Ages 45-54, the Netherlands, 1950-1985**

**Actual vs fitted suicide**



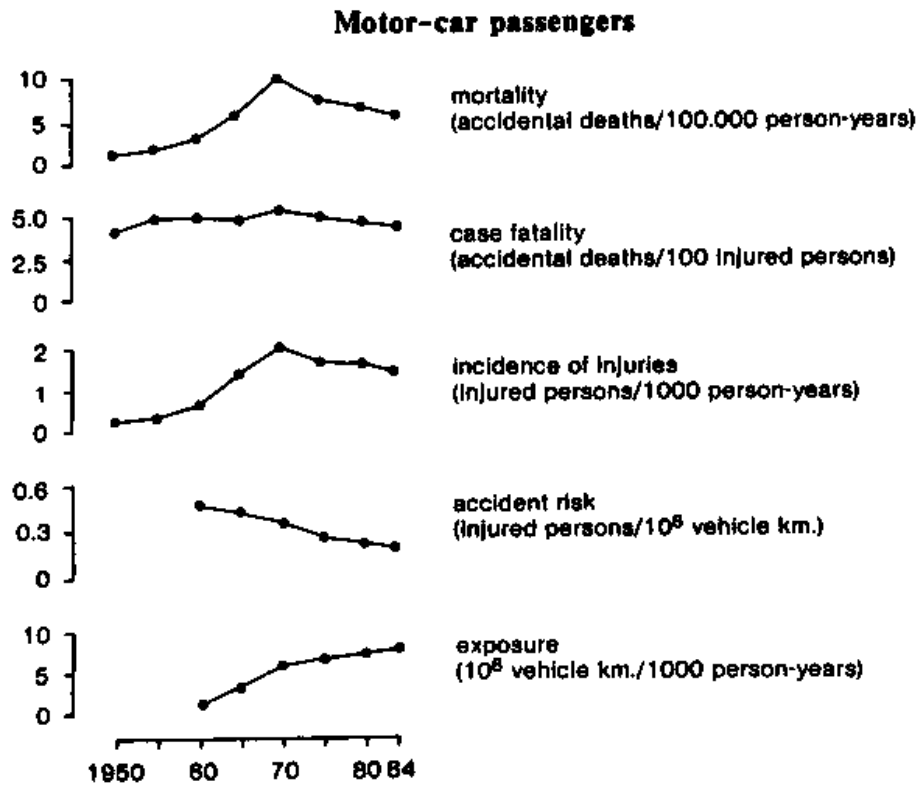
**FIGURE 5**  
Regional variation in changes in unemployment rates, the Netherlands, 1970-1982



Source: CBS

**FIGURE 6**

**Trends in mortality, case fatality, incidence, injury risk and exposure of/to traffic accidents of passenger car occupants, the Netherlands, 1950-1984**



Source: Moser, Fox and Jones, 1984

**Scheme 7.**

Per cent per annum changes in mortality from the leading causes of death, the Netherlands, 1950-1968, 1969-1984, 1980-1984

	50-68	69-84	80-84
Ischemic heart disease	2.8	-1.5	-1.3
Other heart disease	-3.2	-0.3	-2.0
Cerebrovascular disease	-1.4	-2.8	-1.8
Disease of arteries	-2.2	-3.5	8.1
Cancer of stomach	-3.2	-3.7	-2.7
Cancer of colon	0.9	0.1	0.5
Cancer of lung	5.0	2.1	1.0
Cancer of breast	0.9	-0.2	0.0
Cancer of prostate	1.5	0.9	0.7
Influenza/pneumonia	-6.4	-4.0	-2.4
Chron. obstr. pulm. dis.	1.5	0.0	3.5
Traffic accidents	3.2	-5.7	-4.5
Non-traffic accidents	0.0	-4.4	-3.7
Total mortality	-0.8	-1.4	-0.7

Changes standardized for changes in age-composition of population.  
Source: Mackenbach, Kunst, Looman et al., 1988

**Scheme 8**

Results of multiple regression analysis of age-standardized changes in mortality on changes in unemployment rates, the Netherlands, 1970/1974 - 1980/1984, both sexes			
Sign of regression coefficient [a]			
	no control	control for levels [b]	control for changes [c]
Ischemic heart disease			
Other heart disease			
Cerebrovascular disease	++		++
Disease of arteries			
Cancer of stomach			
Cancer of colon	++		++
Cancer of lung			
Cancer of breast			
Cancer of prostate			
Influenza/pneumonia			
Chron. obstr. pulm. dis.			
Traffic accidents	--		--
Non-traffic accidents	++	+	++
Total mortality			

[a] Only statistically significant associations are mentioned in the scheme (- or +: p <0.10; -- or ++ p <.05). Positive signs imply less mortality decline in regions with more unemployment increase.

[b] Controlling for levels of unemployment and 3 confounding variables in 1970/74.

[c] Controlling for changes in 2 confounding variables between 1970/74 and 1980/84.



**Scheme 9**

Results of multiple regression analysis of age-standardized changes in mortality on changes in unemployment rates, the Netherlands, 1970/1974 - 1980/1984, males			
Sign of regression coefficient [a]			
	no control	control for levels [b]	control for changes [c]
Ischemic heart disease		-	
Other heart disease			
Cerebrovascular disease			
Disease of arteries			
Cancer of stomach			
Cancer of colon	++		++
Cancer of lung	+		+
Cancer of breast	n.a.	n.a.	n.a.
Cancer of prostate			
Influenza/pneumonia			
Chron. obstr. pulm. dis.			
Traffic accidents	--		--
Non-traffic accidents			
<b>Total mortality</b>			
[a] Only statistically significant associations are mentioned in the scheme (- or +: p <0.10; -- or ++ p <.05). Positive signs imply less mortality decline in regions with more unemployment increase.			
[b] Controlling for levels of unemployment and 3 confounding variables in 1970/74.			
[c] Controlling for changes in 2 confounding variables between 1970/74 and 1980/84.			