Lard, lice, and longevity: a comparative study of the standard of living in occupied Denmark and the Netherlands, 1940-1945
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Citation for published version (APA):

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During the last great war, tuberculosis mortality was observed to increase more or less in all countries. In Denmark, too, the mortality of the disease increased, so that when the next war broke out it was natural to expect a similar development. (...) Contrary to expectation, tuberculosis during the last great war had not the increased mortality that it had in the years 1914-1918.  

The 1945 final report of the Danish Ernærings- og Husholdningsnævne (EHN; nutrition and housekeeping board) resounds with both relief and bewilderment. Public health had suffered significantly during the First World War, in which Denmark had been neutral. The Second World War, by which Denmark seemed more profoundly affected, had turned out not to have had such disastrous consequences. This was a welcome but unexpected outcome: the EHN had been set up in 1939 to monitor the expected decline in Danish health, and its members were understandably surprised when this deterioration did not take place. After five years of intense monitoring of the Danish population – during which the board’s members had investigated diets, body weight, eyesight, dental status and many other aspects of health – the board’s final conclusion was that the health of the Danish population had mostly improved during the years of the occupation.

The Dutch had been less lucky. Compared to Denmark, where the expected increase in infectious disease mortality remained so conspicuously absent, during the war the Dutch suffered significantly increased mortality rates. Unsurprisingly, the ‘Hunger winter’ of 1944-45 stands out as a particularly deadly period, but even before that disastrous episode the number of deaths per thousand inhabitants increased considerably. This divergence indicates that there was a marked difference in the material circumstances of life in the two countries, but what this difference was is not immediately evident. Something went wrong in the Netherlands (as indeed it did in most of wartime Europe) that did not go wrong in Denmark. It caused mortality in the

65. RA, Ernærings- og Husholdningsnævne 1945.
Netherlands to increase, while living standards in Denmark were sufficiently favourable to avoid such a development.

Although the interplay between economic circumstances and human longevity is still in many respects a mystery, mortality can be used as an indicator of the quality of life. As explained in more detail below, there must have been a relation between the standard of living prevailing in Denmark and that prevailing in the Netherlands and their respective wartime mortality regimes. In addition, mortality is not only an indicator but also an important aspect of the standard of living. While there is scope for argument as to whether or not death is the lowest possible standard of living, it is uncontroversial that an increased risk of dying lowers one’s quality of life. Moreover, high mortality obviously lowers the quality of life of those people who lose their friends and relatives. This is especially the case when parents lose their children, as happened much more often in the Netherlands than in Denmark.

This chapter aims to take the first step towards understanding the interplay of mortality and living standards in occupied Denmark and the Netherlands, by analysing how mortality rates developed and what the immediate causes behind the development were. The following chapters, which investigate the standard of living prevailing in both countries in more detail, will establish the deeper causes of the different outcomes. To analyse mortality regimes in the two countries, four issues will be dealt with. First, a comparison of aggregate mortality rates, standardized for differences in age structure, will be arrived at and a rough estimate will be made of the total number of casualties. Second, the age distribution of mortality – which was remarkably skewed towards the young in the occupied Netherlands – will be investigated, as will a more or less separate pattern of mortality during the Hunger winter and its immediate aftermath. Third, a limited number of infectious diseases that caused numerous deaths in the Netherlands will be analysed and compared with the mortality resulting from the same diseases in Denmark, where they had little impact. Finally, Danish and Dutch mortality will be placed in the context of European mortality at the time.

Measuring wartime mortality
Measuring wartime (or any) mortality regime requires more sophisticated techniques than a mere body count. Because both Denmark and the Netherlands experienced a
rising birth rate from the mid 1930s onwards, the age structure of the population during the period at hand was changing. Moreover, the age structure of the Danish and that of the Dutch population were not identical to begin with. Since mortality is closely linked to age, the different and changing age structures of the populations make a straightforward comparison impossible. Here, standardized mortality rates (SMRs) were used to assess wartime mortality. Rather than calculating the number of deceased per thousand, the mortality rates per age group per year were calculated separately and multiplied by a standard population, after which mortality rates per thousand were calculated as though that population was the population of the country at the moment in question. The Danish population of 1948 is used for standardization purposes.  

**Figure 3.1: Standardized mortality rates (per thousand) for Denmark and the Netherlands**

![Graph showing standardized mortality rates](image)


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As can be seen in figure 3.1, the Danish and the Dutch mortality rates were roughly similar before and after the Second World War, and both followed a similar trend towards low mortality. However, Dutch mortality increased considerably during the occupation, whereas Danish mortality did not. Immediately after liberation, Dutch mortality began to decline sharply and reached unprecedented lows as early as 1947. The general trend towards low mortality that dominated the nineteenth and twentieth centuries was brutally interrupted by the occupation of the Netherlands, but it was not, in the longer run, delayed. After the occupation had ended, the Netherlands did not lag behind Denmark. It is difficult to decide, again, what is the more remarkable finding: that Danish mortality continued its downward trend despite the war, or that Dutch mortality increased so quickly only to tumble again after liberation in a lightning-speed restoration of public health.

On the other hand, what is not remarkable is the finding that mortality increased in wartime. Weapons are manufactured and armies are trained with the explicit aim of being deadly, so there should be no surprise that when they are put to use, death rates shoot up. Although wars were less frequent in the nineteenth and twentieth centuries than they had been before, they had become more prolonged, more expensive and, crucially, more lethal than before. This increased deadliness, however, should not be ascribed primarily to the improved ability of soldiers to kill their adversaries, although the advances made in this field had been remarkable. Rather, it was caused by the exceptionally high civilian death toll that accompanies modern warfare. A total war, such as the Second World War, causes far more civilian than military deaths. Not only did the Second World War cost far more civilian than military lives, but many deaths had causes other than the increasingly sophisticated weaponry deployed on both sides and often against civilian populations. Disease, starvation and the cold killed more Europeans than bombs, bullets and even persecution. Smallman-Raynor and Cliff have proposed the following fourfold categorization of war-related mortality, distinguishing between civilian or military status on the one hand, and the causes of death (whether or not through military action) on the other.67

It should be noted that in the Danish case, none of these four war-related types of mortality was particularly prominent. Little fighting took place in Denmark, so direct military mortality was limited to a handful of victims. The escape of the Danish Jews across the Øresund to Sweden and the low number and intensity of bombardments, meant that direct civilian mortality in Denmark also remained much lower than it did in most other countries. Indirect war-related mortality of both kinds likewise cost only a few lives in Denmark. Neither citizens nor German troops suffered an increase in mortality as a consequence of wartime circumstances of life.

The situation in the Netherlands was different. Direct civilian mortality was considerable, especially because approximately 104,000 Dutch Jewish civilians were deported and murdered. In addition, there were the civilians killed in bombardments and the fighting during the invasion and the liberation, as well as a number of men killed at sea or by bombs while doing compulsory labour service in Germany. The category of direct military mortality – which included primarily the military casualties of fighting during the invasion and during liberation – is much smaller but nevertheless sizeable. Such violent deaths affected very predominantly the death rates of young adult males, of whom about 2000 died as soldiers during the invasion. Likewise, young adults were relatively likely to join a resistance movement and thus meet an untimely death, just as they were most likely to join the Waffen SS or a similar organization, membership of which increased considerably the risk of meeting a violent death. (A similar effect on mortality rates is of course discernible in Denmark.)

In the data used here, only civilian deaths within the Netherlands and Denmark have been recorded. Most notably, this means that almost all of the murdered Dutch Jews, most of whom died in or en route to concentration camps, are excluded. Likewise, many other cases of direct civilian and military mortality (SS volunteers fallen on the Eastern Front, men lost at sea, etc.) are excluded.

The indirect civilian mortality – which forms the bulk of the recorded excess wartime mortality in the Netherlands and is relevant to the question at hand – can be
measured, but not without difficulty. Remarkably, those studying the Second World War in the Netherlands have thus far eschewed estimating the indirect civilian death toll of the war (the same goes for their Danish colleagues, but given the uneventful wartime mortality in that country this is hardly an omission). One of the reasons for this is that until quite recently, no digital records of mortality were readily available, making the job of reconstructing wartime mortality regimes both tedious and time-consuming. This problem has been overcome now that both general mortality and cause-specific mortality, at least for the twentieth century, have become available in digital form.68

Not all problems are thereby solved, however. Indirect war-related mortality is difficult to investigate, because it is difficult to establish which deaths should be classified as war-related and which should not. In cases of direct war-related mortality (e.g. when a person is shot dead by an enemy soldier), there is an evident link between the circumstance of war and a specific casualty. This is not the case with indirect mortality, which primarily takes the form of an increase in normal mortality due to a lowered standard of living, increased exposure to infection and a range of other problems. Tuberculosis (TB) is a case in point. As noted in the opening quote of this chapter, there is an often observed, strong relation between warfare and the incidence of TB. During the two world wars, in most countries TB incidence and consequent mortality shot up spectacularly. There was, hence, an indisputable relation between warfare and this disease. Yet not all wartime TB deaths can be blamed on war. There are many TB deaths in peacetime as well, and there is no obvious criterion to establish a clear link between infection and war in specific cases. However obvious the indirect impact of war on mortality can often be shown to be, it is never possible to determine exactly how much mortality can be attributed to war, because it is impossible to say which particular deaths would not have occurred in its absence.

Even if it cannot be established which specific deaths should be considered indirect civilian casualties, it is possible to estimate the overall impact of war on mortality rates. On the basis of mortality rates during the periods preceding and

68. I am grateful to the KNCV Tuberculosis Fund in The Hague for graciously allowing me to use their datasets.
following a war, a trend can be estimated describing the mortality rates that would likely have prevailed had the war or another such calamity not occurred. A simple, linear regression has been used here to estimate this fictional mortality rate. This estimated trend can be compared to the actual mortality rates, thereby estimating the impact the war had on, in this case, Dutch and Danish mortality. Of course, this method is questionable because there is no way of telling what would have happened to Dutch mortality rates without the Second World War. Comparing wartime mortality rates to an estimated normal trend is a typical example of 'what if' – or in a more positive terminology, 'counterfactual' – history. Moreover, mortality rates fluctuate over time, and such fluctuations cannot be accounted for in a simple estimated trend. Here, a trend has been estimated for the period 1940-45 on the basis of a regression analysis of the mortality rates in the periods 1920-39 and 1947-55.
Figure 3.2 SMRs (per thousand) for the Netherlands (a) and Denmark (b), compared to the linear regression trend over 1930-40 and 1945-50.

Source: Human mortality database (www.mortality.org)

On the basis of these figures, there is little reason to investigate the impact of the Second World War on Danish mortality rates. Apart from the normal fluctuations in mortality, no great (or statistically significant) deviation from the trend is discernible,
nor can changes be linked to the circumstances of war. The Dutch case is obviously a different one. The difference between the regression line and the wartime mortality rates is immediately evident in the Dutch case: wartime mortality was consistently and considerably higher than the regression line, demonstrating the impact of the occupation on Dutch mortality.

Moving from demonstration to calculation is a different matter altogether. After all, SMRs such as those given above reflect the mortality rates of fictitious populations. The actual impact of war on Dutch mortality can be assessed only if the changing age structure of Dutch wartime society is taken into account: it was not the standardized but the actual population that suffered increased mortality. To arrive at an estimate, the fictitious mortality rates were calculated for each age group separately and multiplied by the number of people in each cohort. By subtracting the number thus arrived at from the actual mortality in each cohort, an estimate of age-specific excess mortality of the war years can be arrived at. As can be seen in figure 3.3, the number of excess deaths increased steadily throughout the war years, peaked during the Hunger winter and declined quite rapidly thereafter. These data should, however, be interpreted with the greatest care. The fact that the death toll of the Second World War in the Netherlands is estimated by comparing real death rates to fictitious ones inevitably renders these data less meaningful. They should be taken as estimates. 69

69. Concerning the Dutch case, see e.g.: Mackenbach and Looman, 'Secular Trends of Infectious Disease Mortality in the Netherlands'; Eilers and Borgdorff, 'Analysis of TB Mortality Patterns'. 
Figure 3.3 Estimated number of excess deaths

Source: see figure 3.1

The number of indirect civilian casualties thus estimated is considerably higher than expected. A list of rough figures used until recently by the Netherlands Institute for War Documentation (the source of these figures is unclear) gives the death toll as a result of 'general deterioration of the standard of living' at some 50,000, in addition to 25,000 victims of the Hunger winter. With the method used here, the estimate of total excess civilian mortality as a result of the war is about 160,000, of whom some 65,000 died during 1945 (of which most cases were of course either directly or indirectly related to the Hunger winter). The difference between this figure and the one informally used up to now stems, one suspects, from the fact that the original estimate did not take into account either the changed age structure of the population or the generally downward trend in mortality rates. Although taking them into account will strike many as dubious, it is certainly a more realistic assessment of the counterfactual development of Dutch mortality rates in the absence of war than the otherwise implicit assumption that death rates would have remained at the level of the late 1930s – especially since mortality rates sank well below the level of the late 1930s immediately after liberation.
The Dutch Hunger winter

The most spectacular peaks in the above graphs – namely those in the Dutch mortality regime in 1944 and especially 1945 – can be explained relatively easily. During the period between the liberation of the southern Netherlands in September 1944 and the liberation of the north in the course of April and May 1945, the infrastructure for food and other transportation came to a halt, causing food supplies to become a very local affair. In relatively small cities in rural areas, such as the city of Groningen, people managed to avoid famine by acquiring sufficient calories both from the surrounding areas and from production within the city itself. The urbanized west of the country, however, was simply too densely populated to make do without substantial food supplies from further afield, and it was there that famine became inevitable.

As one would expect in a famine, starvation became a pre-eminent cause of death during the Hunger winter, killing some 9000 people. Other causes of death, however, also increased strongly and in fact killed more people than hunger as such. There are two reasons for this development: first, hunger weakened people’s ability to withstand or survive infectious disease, and second, the disruption of society, the eating of unsafe foods and several other factors (to be explained in more detail below) took their toll. Among the people who died of starvation, economically vulnerable elderly people (particularly elderly men) were heavily over-represented.

70. Duyvendak and de Vries, Stad van het Noorden.
Figure 3.4: Non-violent Hunger winter mortality in Amsterdam, deaths per 10,000 per day

Source: Statistisch jaarboek van de gemeente Amsterdam, Malnutrition and Starvation in the Western Netherlands; Stein et al., Famine and Human development. The number of people in Amsterdam at the time of the famine has, conservatively, been estimated at 90% of the registered population. See also Kruijer, Hongertochten.

As can be seen in figure 3.4, mortality in the city of Amsterdam (the most populous Dutch city) increased steeply during the last two months of 1944, and reached a more or less stable high level during the first two months of the following year. During that period, daily mortality in Amsterdam rose above 1 death per 10,000 people, which is the threshold used to distinguish famines from more moderate food crises. On the commonly used ‘famine scales’ developed by Howe and Devereux, the worst weeks of the Hunger winter in Amsterdam, Rotterdam, The Hague and Utrecht would be categorized as lying at the lower end of level 3 – a level comparable with relatively recent African food crises, such as the Ethiopian famine in 2000. This categorization
is also justified by numerous observations of oedema in the affected areas, as well as widespread wasting, which affected up to 40% of the population.72

Although the intensity, at least in terms of mortality, of the Hunger winter was high, its duration and geographical scope were limited. Between them, the four largest cities in the western Netherlands, which bore the brunt of the famine, were inhabited by roughly two million people during the most severe period, which lasted about nine weeks. While there is no doubt that the urban famines were very serious indeed both in the largest and in several of the smaller cities, their overall impact on the mortality of the Netherlands as a whole was limited. Some 9000 deaths were directly attributed to starvation, but that number is certainly an underestimation of the demographic impact of the famine. The immediate cause of death of people suffering extreme malnutrition was often an infectious disease, to which they had become vulnerable as a result of starvation, but most of these deaths were not, statistically, attributed to starvation. In total, over 20,000 people perished in the large cities in the western Netherlands during the worst weeks of the Hunger winter. This famine, however, was preceded as well as followed by periods of less severe but certainly serious food insecurity and resultant mortality. In all, more than half of the 1945 peak in Dutch mortality consisted of increased mortality in the four largest cities, where only 20% of the population lived. Of the remainder, the most seriously affected were the smaller towns and cities in the urbanized west, which between them had a similar population to that of the four largest cities.73

As is common in famines, the food that was available was distributed very unequally, as was the consequent wasting, oedema and eventual death. Many urban dwellers scoured the countryside for food, often travelling tens of kilometres to find foodstuffs. It is impossible to establish how many people were able to find how much food on these expeditions, but it is clear that they constituted a vital source of

foodstuffs for starving urbanites. However, not everybody was able to venture out of the cities. Given the relatively harsh weather and the lack of proper footwear, clothing and means of transportation, many people were physically unable to travel to the countryside in search of food. Moreover, many men either were doing labour service (Arbeitseinsatz) in Germany or were in hiding from it. Obviously, such men could not freely roam the countryside, and if they were absent, childcare responsibilities often prevented their spouses from travelling. The people who did venture into the countryside for food brought back considerable amounts for family members and other dependants (as well as to sell on the black market), but those without able-bodied carers or the resources to buy food on the black market were effectively without a sufficient supply of food.

In absolute terms, infants and the very elderly made up the majority of the famine dead. In relative terms, however, the most affected age groups were the middle-aged, and especially middle-aged males. This finding, although perhaps counter-intuitive, is congruous with knowledge gathered about other famines. In their investigations of other famines, both Dyson and Watkins and Menken found that these age groups usually suffered a higher relative increase than did the normally vulnerable age groups. The relative vulnerability of men has likewise been observed in other cases. Although famines are, fortunately, too rare and diverse to make very clear general observations about them, the Hunger winter appears to have been a more or less ‘normal’ famine, albeit one of abnormal brevity and a comparatively small scale.

After the Hunger winter, mortality declined rapidly. One exception, however, should be mentioned: infant mortality peaked during the summer following the Hunger winter. This peak should almost certainly be ascribed to prenatal damage incurred during the Hunger winter, especially because the southern Netherlands,

74. G.J. Kruijer, Hongertochten. Amsterdam tijdens de Hongerwinter (Meppel 1951) 270.
75. Kruijer, Hongertochten.
which had been liberated in September 1944, did not experience higher infant mortality during the following summer, whereas the northern half of the country did.77

Before the Hunger winter
Interesting as the winter of 1944-45 may be as a case-study of famine, it is not with regard to those troubled months that a comparison between Denmark and the Netherlands is particularly useful. The Netherlands suffered a subsistence crisis, while the Danes did not. Consequently, the Dutch experienced dramatically increased mortality while the Danes did not – hardly a mysterious course of affairs. What is stranger is that in the years leading up to the Hunger winter, Dutch mortality had increased considerably, whereas Danish mortality had not. It was during this period, namely between 1940 and 1944, that one or more circumstances in Denmark must have been much more conducive to public health than they were in the Netherlands. That said, the development of mortality in the Netherlands does not at first sight appear to have differed terribly much from the situation in Denmark. The Dutch mortality rate was not exceptionally high by contemporary standards, nor was the trend unambiguous: after an initial peak in 1941, aggregate mortality rates declined in 1942, and increased again in 1943. In Denmark, in fact, a similar ‘hump’ can be discerned (see figures 3.1-3.3).

This initial hump, moreover, does not seem much larger than the fluctuations in mortality that are readily observable in both countries during the 1930s, and it is questionable to blame it primarily on the circumstances of war. In the period 1939-42, both countries were plagued by a sequence of relatively cold winters and by a very aggressive strain of influenza. The consequences of this, as in other, non-war years with similar circumstances, included high mortality among the most fragile generations (infants and the very elderly). These generations had always had – and to a lesser extent, still have – a relatively volatile level of mortality. What is of particular interest, however, is what happened to the generations between infants and the elderly, whose mortality rates were not normally given to great fluctuations.

On closer inspection of those age groups, however, a trend is revealed that is neither moderate nor ambiguous. As shown in more detail in Appendix A, changes in

77. Stein et al., Famine and Human Development.
mortality during the period 1940-44 differed much between age groups. Dutch children and adolescents experienced a very significant increase in mortality during each consecutive year of the war. The increase was substantial: in several age groups, mortality had doubled by 1943. Older age groups, on the other hand, appear to have been much less affected, if they were affected at all. Compared to the steady increase in child and adolescent mortality, middle-aged people remained largely unaffected until the onslaught of the Hunger winter. It appears that something was exerting a persistent negative influence on the health of Dutch youths during the war years, while not affecting older compatriots in a similar manner. Or was this the case? As a rule, children and adolescents have lower mortality rates than older people, and hence a slight increase in absolute mortality will affect the relative mortality of these age groups particularly strongly. As will be shown below, however, it was the young who bore the brunt of wartime civilian mortality, in both absolute and relative terms.

It is here, moreover, that the comparison with Denmark is particularly pertinent. How did Danish children fare in during the same period? The fact of the matter is that young Danes did remarkably well not only in comparison with their Dutch peers but also in comparison with older Danes. Danish child and adolescent mortality declined during in the period in which mortality in the same age groups in the Netherlands consistently increased. This is, to say the least, a rather remarkable finding. Because of the similarity of the two occupation regimes and the economic problems of the time, one would have expected the difference between the Netherlands and Denmark to have been at most gradual, with Denmark perhaps being impacted somewhat less than the Netherlands. This appears not to have been the case. In Denmark, the factor or factors that drove up child mortality in the Netherlands were not merely less strong but almost completely absent.
Figure 3.5: Age-specific mortality rates per 1000, 10- to 14-year-olds, Denmark and the Netherlands, 1938-49

Source: See Appendix A

Causes of death
Underlying these neat aggregate mortality rates are a multitude of causes of death, the incidence of some increasing and that of others decreasing, in the course of the war. There are many ways to die, and unpredictable occurrences — such as the sudden arrival of a micro-organism or a few weeks of cold or hot weather — can have a massive impact on the death toll resulting from a specific cause. To discern the patterns underlying the observed increase in aggregate mortality, it is necessary to separate the structural changes in the causes of death in Denmark and the Netherlands from the chaotic and multifaceted muddle that cause of death statistics inevitably are. By calculating standardized mortality rates for specific causes of death, the development of various causes over time can be investigated, and their impact on the observed divergence between Denmark and the Netherlands assessed. It should be noted, with regard to these issues, that not all causes of death necessarily increased in incidence; a number of them actually declined. Diabetes mortality, which is often related to obesity, declined by about a hundred per annum ascribed deaths in the Netherlands, probably because of the leaner diet. The
incidence of other causes of death either remained stable or fluctuated too much from year to year to allow a clear trend to be established.

The vast bulk of the wartime increase in Dutch indirect civilian mortality was caused by a sharp increase in infectious disease mortality. Infectious diseases, such as TB and diphtheria, killed considerably more people (especially young people) during each of the five years of the occupation than during the preceding and subsequent years. The incidence of almost all infectious diseases increased strongly during the occupation, but only a handful of diseases caused the majority of wartime excess deaths. Below, a few of the largest, and most significant, killers will be treated in more detail. That said, the increase in infectious disease mortality was not as such disease-specific: the incidence of virtually all infectious diseases in the Netherlands increased during the German occupation.

Remarkably, as noted, a deadly upsurge in infectious disease such as struck the Netherlands did not occur in Denmark. There, the number of deaths caused by infectious diseases did not rise much, although some infectious diseases were on the rise during the war years. Some of those diseases (such as dysentery) were major killers in the Netherlands, but their effect was far less in Denmark; that is to say, there were fewer resultant deaths, but whether there was a correspondingly lower number of people suffering from those infectious diseases is more difficult to establish. Considering the circumstances at hand, it certainly would be dangerous to too readily equate changes in disease-specific mortality with changes in incidence. It would be highly advantageous to the investigation at hand to be able to compare disease incidence and disease mortality statistics for each of the two countries.

That, however, is not possible. Disease incidence, especially in times of war, is difficult to measure. The circumstances of occupation could offer a strong impetus to wilful misdiagnosis. The obligation of Dutch men, for example, to report for work in Germany, could often be averted by successfully claiming to have a dangerous infectious disease, such as TB. There is good reason to suspect that many of the registered cases of disease in both Denmark and the Netherlands were downright fraudulent — and fraud is not the only problem with regard to disease statistics.

Before and during the outbreak of war, both the Dutch and the Danish authorities improved their registration of diseases in order to monitor the expected adverse health effects of the war (the establishment of organizations like the EHN is a case in point). Although this development increased the administrative grip on disease incidence, it is impossible to say how successful they were and hence to what extent this would have influenced statistics. Fundamental changes in the Dutch health-care system further added to the muddling of wartime statistics. The introduction of comprehensive health insurance in the Netherlands in 1941 substantially improved access to medical services, so that more people could seek treatment and hence be registered as having a certain illness. On the other hand, the medical services in both countries came under considerable pressure during the war, which may have had a reverse effect, namely towards under-registration. It is therefore impossible to construct reliable series on disease incidence in either of the two countries, let alone make an informed comparison of them.

These problems are much less marked with regard to mortality records. Because obtaining a death certificate in both countries has always required an investigation by a qualified medical doctor, mortality records are generally of good quality. However, this does not mean that the records are flawless. Doctors often described deaths as being caused by such inconclusive medical problems as 'general weakness' or the hardly more revealing 'various causes'. Still, even though not all entries are particularly elucidating, and there is always the possibility of the misjudgement of a cause of death, statistics on causes of death for these two countries are nevertheless reasonably reliable. The problem of fraud had far less impact on mortality statistics than on disease incidence statistics. It may have been useful to misdiagnose a person as dangerously ill in order to protect him (the issue was much less relevant to women), but it is difficult to see how such an effect could have played a role for people who were already dead.

As said, disease mortality is only a rough indicator of disease incidence; weather conditions, medical care and many other more or less coincidental circumstances can exert significant influence on disease mortality. A further, though not insurmountable problem is the different lethality of disease over time. This is a

79. Klemann, Nederland 394.
problem in any assessment of disease data over relatively short periods. For example, the annual appearance of the flu is caused by a different strain of the influenza virus each year, and consequently has a highly divergent severity, as the high influenza mortality in both countries in 1940 and 1941 demonstrate. 80

The comparison of the Netherlands with Denmark, fortunately, solves much of the problem of different strains of microbes over time. Denmark and the Netherlands were part of the same epidemiological environment, both because of the short distance between the two countries and because of the relatively intensive traffic between the two and to and from Germany. The changes in disease lethality, in so far as they were caused by varying strains of bacteria or viruses, can safely be assumed to have been almost identical in Denmark and the Netherlands. This would be the case particularly with propagated infectious diseases, that is to say, those that are spread by humans themselves. 'Common-vehicle diseases', which are spread by a common medium such as contaminated water, milk or food, were less likely to travel, but the vast bulk of the diseases responsible for the increased mortality in the Netherlands, and so conspicuously absent from Denmark, were propagated ones. 81

The number of registered causes of death in the two countries is enormous, and it hardly makes sense to investigate them all separately. Although during the occupation most infectious diseases were on the rise (some of them spectacularly so), the number of deaths resulting from most diseases was limited. It is worthwhile to investigate in detail a few of the diseases that both played an important role in wartime mortality and increased strongly during the occupation. By comparing Danish and Dutch SMRs of these diseases, the different impact of the same infectious diseases on mortality in each of the countries can be shown. 82

**Tuberculosis**

TB has accompanied mankind since time immemorial. Egyptian mummies show that some pharaohs had been sufferers, while Hippocrates considered phthisis (as he

80. See below, page 81.
termed it) to be the most widespread disease in his own time. Regrettably, the role of TB is not yet played out. It remains very much a modern-day disease, taking over 2 million lives per year, mainly in the developing world, despite the fact that effective chemotherapy against it has existed for decades.\textsuperscript{83} In the 1940s, however, effective cures were not available and immunization, although not impossible, was uncommon. TB declined throughout the twentieth century in Europe, but in the 1940s it was still very much the killer that it had been for centuries (and still is in much of Asia and Africa).

TB is caused by the bacteria \textit{Mycobacterium tuberculosis}, a rather sturdy organism that survives in a range of hosts, including cattle. To make matters worse, TB is very easily transmitted in a variety of ways, ranging from drinking infected milk to talking with an infected individual. As a result, it can (and often does) spread rapidly in human populations. TB may infect the gut, the brain or other organs and lead to a great variety of lethal medical problems. Most commonly, however, it is primarily the lungs that are affected by TB, and pulmonary TB accounted for the overwhelming majority of TB deaths during the 1940s. As a rule of thumb, about half of all TB patients die without modern treatment, so that the death rates reported here reflect a number of sufferers roughly twice as large.\textsuperscript{84}

TB had been on the decline in both Denmark and the Netherlands throughout the first decades of the twentieth century. In part, the causes for this decline are more or less known. Measures to prevent the contamination of cow herds and their milk with TB (the latter through pasteurization) had some effect, and from the 1930s onwards some efforts were made to immunize people against TB (especially the children of infected parents).\textsuperscript{85} Still, treatment was at best moderately effective before the early 1950s, and its role during the war years can be assumed to have been minimal.\textsuperscript{86}

The Danish health authorities, as mentioned, were bracing themselves for a major outbreak of TB when war broke out, but there was no increase at all. As is

\textsuperscript{84} K. Styblo, \textit{Epidemiology of Tuberculosis} (The Hague 1991).
\textsuperscript{85} Kiple, \textit{Cambridge World History of Human Disease} 1058-1066.
\textsuperscript{86} Styblo, \textit{Epidemiology of Tuberculosis} 19.
evident from figure 3.6, the development of TB mortality in the Netherlands was dramatically different. The five years of occupation stand out as a period of sharply increased TB mortality. Interestingly, Dutch TB mortality began to rise immediately after the German invasion and declined very soon after the liberation. The number of deaths attributed to TB roughly doubled in the Netherlands in the course of the occupation, an increase that had almost completely disappeared within a year after liberation.

Figure 3.6: SMR of tuberculosis mortality (all types) per 10,000 in Denmark and the Netherlands

Source: see note 66

Two further observations can be made about Dutch wartime TB mortality. First, increased TB mortality did not affect all age groups equally. As should perhaps be expected in the light of the above, the increase in TB primarily (though certainly not exclusively) affected the young. Children and young adults suffered a more marked increase than did older people, and the increased mortality arrived somewhat earlier in these than in other age groups. Another interesting feature regarding the age
groups most affected is that as the occupation progressed, the elderly came to suffer from a considerably increased TB mortality. This rise is very likely ascribable to reactivated TB; that is to say, people who earlier in life had suffered from and but had survived TB, relapsed into TB after coming into renewed contact with a new infection.87

Another interesting aspect of the increased TB mortality in the Netherlands is the uneven sex distribution thereof. Males in the 19-24 age group were considerably more likely to die of TB than were their female peers, while females in the 9-14 age group were at a considerably greater risk than the males. The latter phenomenon is not uncommon: humans’ sensitivity to TB increases sharply during puberty, which begins earlier in girls than in boys. The greater sensitivity of young men in comparison with young women, however, is a more surprising finding, and will be dealt with in Chapter 9.88

Diphtheria
The respiratory disease diphtheria was another major wartime killer. Like TB, diphtheria is caused by a bacteria (*Corynebacterium diphteriae*) that spreads easily and quickly through the coughs and sneezes of infected individuals. Because it is airborne, diphtheria tends to erupt relatively suddenly and often claims numerous victims. In serious cases, the disease causes the lymph nodes in the neck to swell, making swallowing and, eventually, breathing difficult. A sheet-like membrane develops on the tonsils and in the throat, further adding to suffocation. Apart from these problems, diphtheria can drive up heart rates and lead to a cardiac arrest, or paralyse heart and lung muscles. Although the survival rates for diphtheria patients are typically significantly better than those for TB patients, the disease still tends to be fatal in 5-20% of cases, especially among the under-5s and the over-40s. Diphtheria was a grave problem in Europe during both world wars.89

It is hardly surprising, therefore, that Denmark did not escape the increase in diphtheria altogether unaffected. During the occupation, diphtheria mortality

87. Styblo *Epidemiology of Tuberculosis* 30.
88. Eilers and Borgdordff, ‘Analysis of TB mortality Patterns’.
increased considerably in Denmark: in 1943 the incidence was double and in 1944 triple the prewar rate. Interestingly, the increase in diphtheria in Denmark affected adults, and especially young adults, much more strongly than children. This is quite remarkable, since diphtheria normally kills far more children than adults. During the worst diphtheria years, however, less than half the diphtheria victims in Denmark were children. This suggests that the upsurge in the disease in Denmark was caused to a great extent by the heightened exposure of very particular (adult) groups to sources of diphtheria infection. Another possible explanation for the relatively low number of children among diphtheria victims is that in Denmark, in the months leading up to the war, a campaign was set up to immunize children. Although neither the success of this campaign (in terms of the percentage of children treated) nor the effectiveness of the immunization can be assessed with certainty, it certainly seems a reasonable explanation for the relatively low share of children among the victims.

The development of diphtheria in Denmark, although significant, was dwarfed by the increase in the disease in the Netherlands. By 1943, diphtheria mortality was 30 times as high as it had been in the late 1930s, and in 1945 almost 50 times as high. As can be seen in figure 3.7, the increase in diphtheria mortality in the two countries during the occupation was not as such dissimilar, but the development was roughly ten times as strong in the Netherlands as in Denmark -- which is quite a spectacular difference. A further difference that may hint at the explanation for the different outcomes in the two countries is that in the Netherlands the increase in the disease did not primarily affect adults. While in Denmark, as said, the increase in diphtheria mortality coincided with a marked increase in the share of adults in that mortality, diphtheria mortality in the Netherlands was and remained primarily a problem of children and teenagers. In 1945, adults comprised almost a quarter of the total number of fatal victims of diphtheria, but in other years their share remained well below 15%. This is an all the more remarkable finding considering that the immunization of children had been introduced in the Netherlands, as it had in Denmark. It is not clear whether the different outcomes should be ascribed to differences in immunization or to other factors.

90. Sundhedsstyrelsen, Dødsårssagerne (Copenhagen, various issues).
Dysentery

Dysentery is truly a disease of war. Although dysentery can and does break out and claim lives in times of peace, its spread is much helped by military operations, because of the large concentrations of troops under less than ideal circumstances combined with high mobility. Many wars, such as the Crimean war and the American civil war, were marked by enormous outbreaks of dysentery. More recent conflicts, such as the Korean war, also saw lethal dysentery outbreaks among the troops. The Second World War, unsurprisingly, was no exception. Europe was rife with dysentery during the early 1940s. Although dysentery is very much a soldier’s disease, it also affected civilian populations during the world war, killing thousands of Europeans.91

There are several variants of dysentery, but in the case at hand only the bacterial variants (which are caused by various species of *Shigella* bacteria) are relevant. Amoebic dysentery, which is water-borne, claimed only very few victims in the countries at hand, proof of the good sanitary conditions in the Danish and Dutch water supply. The bacterial variants, which did claim numerous victims in both

countries, are primarily spread through human faeces and contaminated food. The disease is therefore closely linked with hygiene: the unsanitary conditions that often prevail among soldiers explain much of the spread of these bacteria during military conflicts. As can be seen in figure 3.8, dysentery mortality peaked spectacularly during the Dutch Hunger winter, a phenomenon undoubtedly related to the falling standards of food hygiene in the famine-affected areas. No such peak can be discerned in Denmark.

That is not to say that Denmark did not suffer at all as a consequence of the wartime dysentery epidemic that was plaguing Europe. Dysentery had been very rare in Denmark before the war, as indeed it had been in the Netherlands, and the re-emergence of the disease was cause for considerable concern. From 1942 onwards, therefore, dysentery mortality was a reported disease in Denmark; thus, reliable data from that year onwards are readily available. In 1943, the disease struck hard, killing 29 people. This figure, of course, is insignificant in the bigger picture of Danish mortality, but it is highly relevant to our understanding of the epidemiological consequences of the occupation. The 29 deaths in 1943, after which the disease declined again, indicate that at least hundreds of people had fallen victim to what is usually a non-endemic disease.

In the Netherlands, the death toll from dysentery was, again, many times higher than in Denmark. This was the case particularly in 1945, when dysentery alone took over 1600 lives. Given the fact that the spread of dysentery is so closely linked to food safety, this will hardly come as a surprise. In the wake of an acute famine and the collapse of the regular channels for food distribution, low standards of food hygiene are an expected outcome. There is more to dysentery, however, than its enormous human cost during the Hunger winter alone. Before that catastrophic event, dysentery was quite strongly on the rise in the Netherlands, just as it was in Denmark, although the development was considerably stronger in the former country. What is remarkable, when the two countries are compared, is again the age of the casualties. Of the 29 Danes who died of dysentery in 1943, 23 were over 18 years of age. If one takes the different size of the population into account, this number corresponds reasonably well with the number of adult victims in the Netherlands.

92. Sundhedsstyrelsen, Dødsårsagerne.
which stood at 69 in the same year; the likelihood of dying of dysentery was roughly equal, and very small, for Danish and Dutch adults. However, this was not so for their children. Against the 6 fatal victims under 18 in Denmark, stand 79 cases in the Netherlands. The proportionality among adults is hence not mirrored among children, although the numbers are moderate. Nevertheless, in 1943 a Dutch child was five times as likely to die of dysentery as his or her Danish peer. These numbers, of course, are too low to be fully representative of the epidemiological climate in either country, but they do point further towards the notion that Dutch children were somehow much more vulnerable to infectious disease than Danish children were.

Figure 3.8: SMR of dysentery mortality per 10,000

![Graph showing SMR of dysentery mortality per 10,000]

Source: see note 66

Influenza

Unlike the other diseases discussed here, influenza is caused by a virus rather than bacteria. There are three categories of influenza (prosaically known as A, B and C), but only the A variant is a cause of pandemics and mass mortality. Influenza has long been widespread throughout the world and present in both human and animal populations. The disease arises annually in more or less vicious pandemics, often of
global proportions. Crucially, influenza is genetically unstable and arises in a different variant with each new pandemic, often of very different lethality. As is evident from figure 3.8, the early 1940s were bad years in terms of influenza, a fact that should primarily be blamed on genetic changes of the influenza A virus rather than on an improvement of other circumstances.93

If one compares Danish and Dutch influenza mortality, it is remarkable that before, during and after the war influenza mortality in the Netherlands was consistently twice as high as in Denmark. This may have been at least partly the result of the ambiguities of the diagnosis. In many cases, patients who die as the result of an influenza infection, die of the pneumonia that arises in many such cases, rather than of influenza as such. In establishing the cause of death, this leads to an obvious problem of categorization, in which it seems that the choices made in Denmark were different from those made in the Netherlands. Although that does not exclude the possibility that there was a fundamental difference in influenza mortality between the two countries, it does, regrettably, mean that there is no way of finding out whether there was.

That said, the years with high and low influenza mortality in the two countries do correspond neatly. As expected, of course, since the annual outbreaks of variants of influenza usually affect whole continents at once, Denmark and the Netherlands without doubt faced the same strains of influenza A in the period at hand. Although generally the highs and lows in both countries correspond, 1941 poses an exception. In that year, influenza killed several times more people than in normal years in the Netherlands, whereas no such effect existed in Denmark. What the years of high influenza mortality have in common, moreover, is that they correspond with the sequence of relatively cold winters in the years 1939-41.

Figure 3.9: SMR of Influenza mortality per 10,000.

Source: see note 66.

Diseases compared

The above discussion of four diseases does not, of course, constitute a comprehensive overview of infectious disease mortality in Denmark and the Netherlands, but it does highlight a number of important aspects thereof. In a number of cases, diseases can be shown to have increased in both countries, but their impact on mortality was much stronger in the Netherlands than in Denmark. In the light of the generally similar fate of these two countries in the war, the increase in a number of very similar public health problems (dysentery, diphtheria) is not as such surprising, although the vastly stronger impact thereof in the Netherlands is. Very interesting in this respect is the development of TB in the two countries. This fatal disease, which killed over 26,000 people in the Netherlands during the five years of the occupation, did not increase at all in Denmark. Although one could counter that TB mortality did not decline much either, it is clear that Denmark largely escaped the deadly onslaught that the Netherlands experienced. In all, it is clear that not only was increased infectious disease mortality an important force behind the increase in indirect civilian mortality in the Netherlands, but also that, when investigated in detail, the differences between the two countries become clearly visible.
The international context
Although the investigation presented in this thesis focuses on only two countries, there were of course many more countries facing similar problems. Given the remarkable differences between the mortality regime prevailing in Denmark and that prevailing in the Netherlands, it is interesting to widen the comparison to find to what extent either country’s experience was unique, or whether it fits a more general European pattern. As can be seen in figure 3.10, the Dutch experience of increased wartime death rates corresponds quite well to the pattern prevailing in other German-occupied countries. Research into the increase in mortality rates in most of these countries, however, is still in its infancy. What is available is speculative, but certainly interesting.

When investigating (admittedly superficially) Belgium, Czechoslovakia and France, it is evident that these countries too suffered a marked upsurge in mortality, not unlike the Netherlands. The occurrence of increased wartime mortality sets these three countries apart from Denmark. Seen in a European context, Denmark really is the odd man out.
Increasing mortality, moreover, was not limited to the occupied countries. In a recent article, Jörg Baten and Andrea Wagner analysed the health of German children between 1933 and 1937. During these first years of Nazi rule, a number of significant economic improvements were achieved (notably full employment) that could be expected to lead to improvements in child health. Remarkably, however, the reverse was the case. Baten and Wagner found that child health had been better in the later years of the Weimar Republic than during the first years of the Third Reich. Both in terms of growth and mortality, children in the 5-15 age group were worse off under Nazism than children of the same age had been only a few years earlier. Baten and Wagner blame two developments for the deterioration of child health. First, they point out that the Nazi state, while providing many more people with employment than Weimar republic ever could, reallocated funds from public health initiatives to armament. Second, they blame import restrictions on protein-rich foods, which the Nazi government had introduced to stem its foreign currency crisis and achieve autarky. Apart from the merits of their analysis of mortality in Germany (which will be discussed in more detail in Chapter 9), the findings of Baten and Wagner are of

considerable relevance to the investigation at hand. The changes in German child mortality between 1933 and 1937 bear more than a passing semblance to the observations of Dutch child mortality between 1940 and 1944. Although the observed changes are not identical, one might at least suspect that National Socialist rule in both countries had similar consequences with regard to public health. On the other hand, National Socialist rule had no such effect in occupied Denmark.

Another interesting, and almost contemporary, set of observations concerning civilian mortality in wartime Europe stems from Isabella Leitch. In her watershed 1950 article 'Growth and Health', which emphasized the relation between nutrition and growth, Leitch considered the importance of wartime medical problems. In both Britain and Germany, Leitch observed, diseases like TB claimed far more lives in wartime than in peacetime. However, she also found that TB mortality had increased far more in Britain and Germany during the First than during the Second World War. This is a remarkable finding, because the impact of the First World War on Britain and Germany was in most respects much milder than it was in the Second World War, simply because the former was not fought out in those countries. Leitch therefore considered a number of explanations for wartime TB (such as blackouts, bombardments or evacuation) to be improbable causes of the phenomena she observed. The wartime increase in TB, after all, had been observed in both countries during both wars, also in cases where no blackouts, bombardments and such like had taken place, such as in Britain during the First World War. Leitch believed that war-related medical problems were mostly caused by nutritional deficiencies, and professed that '... underfeeding, which produces underdeveloped people, also interferes with the processes which determine immunity or susceptibility to TB'.

In the light of all this, the increase in Dutch mortality, again, is not nearly as bewildering as the unaffectedness of the Danes. Germany itself, and apparently many other countries as well, suffered a decline in general health, and specifically in child and adolescent health, under National Socialist rule, but the Danes were strangely immune to the apparently averse health effects of their new political masters. Having established this, moreover, the significance of the comparison of

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these two countries is evidently heightened. A comparison between Denmark and the Netherlands under German occupation can not only elucidate the causes of the upsurge in mortality in the Netherlands, but also shed light on the much wider ranging subject of indirect civilian mortality during the two world wars. Although it would be foolish to claim that an investigation of two small and in many ways untypical countries can explain demographic phenomena pertaining to most of continental Europe, it may well offer a starting point for an analysis of European wartime mortality as a whole. Although our quest focuses on the mystery of the dying Dutch, the true mystery seems to have been that of the surviving Danes.

Conclusion
The different outcomes, at least in terms of mortality, of the occupation of Denmark and that of the Netherlands are remarkable, if not spectacular. Under seemingly similar circumstances, very dissimilar outcomes ensued, which alone licenses a further investigation, especially because the increase in Dutch mortality during the war years was considerably greater than was long believed. The remarkable age distribution of the increase and the very rapid catch-up after liberation add to that relevance. Why did Dutch mortality develop in such a strange manner? In an international context, however, the reverse question is the more interesting one: why did Denmark escape the fate that befell almost all other Nazi-occupied countries?