Lard, lice, and longevity: a comparative study of the standard of living in occupied Denmark and the Netherlands, 1940-1945
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Filth, food and infectious disease mortality

Until September 1944 rations were low, but without causing any irreparable problems. Death rates increased, contagious diseases increased, partly undoubtedly as a result of inferior nutrition, but for a large part as a consequence of the lack of other products, such as clothing, footwear, fuel, cover, and last but not least soap... 360

The above quote from S.L. Louwes, which stems from his defence of his policies as leader of the RBVVO, makes clear why it is difficult to establish causal relations in historical epidemiology. The number of factors potentially contributing to disease or mortality regimes is almost literally endless. This poses a problem, of course, to any investigation of Dutch wartime mortality. As explained in Chapter 2, child and adolescent mortality increased significantly in the Netherlands in the years before September 1944, but not in Denmark. The standard of living in the two countries, which has been investigated in detail in the past four chapters, must in one or more ways have been so different that it can explain the divergent impact of occupation on public health. The comparative investigation of Denmark and the Netherlands offers a possible way out of the problem of identifying the causes of Dutch wartime mortality. Hitherto, as noted, rather generic explanations, not dissimilar to the ones given in the Louwes quote above, have dominated Dutch historiography. Lou de Jong, in his seminal history of the Netherlands during World War II, placed food shortages (of which he had little concrete understanding at the time) centre stage as the cause of declining health, alongside the cold, the mass movements of people and, especially, the loose wartime morals. 361 In contrast, Trienekens and Klemann are much more optimistic about the wartime diet, but they too adhere to the image of a general decline in the material standard of living as the main cause of increased

360. NIOD N138, dossier III, E5 (Louwes). 'Mijn beleid tijdens de Duitsche bezetting van Nederland'.
361. De Jong, Het koninkrijk Volume 7, bind 1, 255.
mortality in the Netherlands before the Hunger winter. However, these explanations do not differentiate quantitatively between the various contributing factors. In the light of the previous four chapters, this is hardly satisfactory: many of the developments traditionally considered to explain the Dutch mortality regime clearly took place in Denmark as well, without having any such impact.

Any explanation or set of explanations for the difference between the Dutch and the Danish mortality regime must meet the three crucial requirements formulated in Chapter 2: it must explain the stark difference between the two countries; it must explain the remarkable sensitivity of children and adolescents to the circumstances of occupation in the Netherlands; and it must explain why increased mortality disappeared so suddenly after liberation. These three criteria, when applied in combination, provide a stringent yardstick with which to realistically assess the impact of various developments on Dutch mortality, and can be applied to the findings presented in Chapters 3 to 8.

As shown in those chapters, Danish and Dutch living standards gradually declined during the occupation. Although the poor were the main victims of this development, scarcity came to affect virtually everybody, and the lower strata gained economic ground relative to their richer compatriots. By the time liberating forces marched in, Denmark and the Netherlands were quite literally in rags. Houses were overcrowded and under-heated, and shoes were of dismal quality and often had been mended many times. Rubber tyres, tobacco and soap were in short supply. To make matters worse, the streets were teeming with black marketeers – the people who truly profited from the occupation. Many farmers had also been doing very well for themselves, as had others who were in some way active in food production. Many people in the Danish and Dutch economies had in fact become very wealthy; there simply was painfully little for sale.

As we have seen, there were also differences between the two countries, and these may offer an explanation for the remarkably divergent mortality regimes. The military violence and repression with which the Danes were confronted was undoubtedly milder than that faced by the Dutch. In other respects – such as footwear and soap – the Dutch may or may not have been slightly better off. In most

respects, however, the Danes appear to have fared similarly to, or only marginally better than, the Dutch. There was, of course, one very big difference between Dutch and Danish living standards: while the Dutch were forced to consume much leaner foods than before and had to go without many of the staples of their prewar diet, the Danes were eating as richly as before and washing down their meals with copious amounts of alcohol. Although it was hardly what the medical establishment would have advised people to consume, it very clearly was the preferred diet of many people at the time, and had the Dutch been aware of the food situation in Denmark, it would have filled them with envy. Two questions remain, however: which diet was the healthiest, and was Louws right in ascribing the deterioration of public health primarily to factors other than food?

Why did the Danes escape increased mortality during the war? In this thesis, the various possible explanations for the remarkable Dutch wartime mortality regime — explanations that concern conditions that that must have been absent from Denmark — are treated in four categories. In the first place, there is a category of explanations that focus on the proximity of people to each other and the consequent risk of contagion. The occupation of Denmark and the Netherlands brought people physically closer together, through evacuations, hiding, queuing and many other wartime phenomena. Moreover, the introduction into Dutch and Danish society of troops — a body of people with its own particular diseases and medical problems — potentially added to this effect. A second set of explanatory variables concerns declining hygiene: soap shortages and a declining hygienic attitude have been blamed for the changes in Dutch mortality during the period 1940-44. A third set of explanations relates to what today would be called ‘food safety’: as mentioned, especially clandestine meat production in both countries often left much to be desired in the way of hygiene, which of course was a threat to public health.

These three sets of explanations all relate to the risk of contagion, that is, the risk of coming into contact with micro-organisms that cause infectious diseases. A final set of explanations — including stress, malnutrition and mysterious, undetected infections — focuses on the human organism’s defence against the infections encountered. If immunity was compromised in the Netherlands but not in Denmark, that would explain the very different reaction, in terms of disease mortality, to otherwise similar circumstances in the two countries.
Crowds and crowding

Propagated diseases, as noted in Chapter 2, caused the bulk of the excess mortality in the Netherlands during the early years of the occupation. Since diseases are propagated through human contact, any intensification of such contacts can be expected to have an effect on the incidence of propagated diseases. There were many factors that increased the level of physical proximity and interaction between people in the Netherlands. Reason enough, hence, to investigate how human interaction changed in both countries, so as to establish to what extent the movement of people and increased interaction may explain the increased mortality in the Netherlands.

Intensified movement as a result of the evacuation and migration of people seems a likely cause of increased contact between people, and consequently of increased disease incidence. The displacement of large groups of people over relatively long distances, a phenomenon typical of modern warfare, is known to promote the spread of infectious diseases. The movement of troops, refugees and evacuees often leads to both the introduction of diseases in populations where they had not previously been endemic, and to overcrowding in receiving areas.363 During the occupation of the Netherlands, hundreds of thousands of people were evacuated from the west coast (including Ijmuiden and parts of The Hague), went to Germany to work, or were otherwise moved about or cramped together. This may have helped the spread of infectious disease considerably. Research into the British case has shown that the evacuation of children during the Blitz did lead to outbreaks of disease among both children and adults in the receiving areas. These outbreaks, however, were mostly short-lived and far from lethal.364 Increased human traffic may of course have impacted public health differently in the Netherlands. Evacuations and other forms of human traffic could lead to overcrowding in receiving locations, especially since the majority of evacuees were housed in the homes of other families.365

363. Smallman-Raynor and Cliff, War Epidemics, 238.
A very specific section of inter-regional migrants were the (mostly) young men who either went to Germany to work in the Arbeitseinsatz or went into hiding to escape such work, especially after 1943. Since young males suffered the strongest rise in pulmonary TB in the Netherlands, it is tempting to blame the increase in this disease on the fact that those circumstances could have dramatically increased the contact between them and others, thereby helping TB propagation. The comparison with Denmark, however, belies such a notion. As explained in Chapter 5, a proportionally similar number of Danes worked temporarily in Germany as labourers, soldiers or builders, or worked in central Jutland in turf and lignite mining.\footnote{366} Moreover, over 100,000 (mostly young) Danes migrated to the great building sites on the west coast, to work on the erection of the Atlantikwall, where they were often housed in barracks.\footnote{367} If the movement of young Dutch men really was a driving force behind their contracting of TB, the difference with Denmark begs explanation. Why would Danish men be impervious to increased proximity if it was the cause of such dramatic turns of affairs in the Netherlands? Seen in this light, the voluntary and involuntary mobility of young Dutchmen is hardly a sufficient explanation for the sharply divergent mortality and disease regimes in the two countries.

Another body of (predominantly) young men possibly responsible for the spread of infectious diseases were the soldiers of the occupying armies. Disease was often rife among the ranks, hence the spread of disease could have been facilitated by their presence in the occupied countries. As explained in more detail below, soldiers played an important role in the dissemination of venereal diseases in both countries. Whether the presence of troops can help to explain the difference between Denmark and the Netherlands is, however, highly questionable. The interaction between troops and civilians was extensive in both countries, and the soldiers generally stemmed from the same (i.e. German) population.\footnote{368}

If the movement of people as such does not explain the difference between Denmark and the Netherlands, overcrowding seems a likelier explanation. As

\footnote{366} See page 121 above.\footnote{367} Bundgård Christensen, Bo Poulsen and Scharff Smith, *Dansk arbejde, Tysk befæstningsanlæg.*\footnote{368} Jensen, S., *Levevilkår under Besættelsen.*
explained in Chapters 3 and 4, the lull in civilian building activity, evacuations, bombardments and especially the rapidly growing population led to a serious housing shortage in the Netherlands. The effect of overcrowding on the risk of disease propagation may have been aggravated by the acute shortage of fuel. Given the difficulty in keeping homes adequately heated, it is quite conceivable that people huddled together in the few spaces that were reasonably warm. A related effect may have been caused by the shortage of bed linen. With sheets and blankets in short supply, children reportedly shared beds more often than they had done before the war, thereby increasing even further their chances of contracting a propagated infectious disease.\textsuperscript{369}

As compelling as these explanations for Dutch ill-health may seem, when scrutinized more closely they fail to meet our three criteria. In the first place, the closer proximity of people to one another did not end after liberation (rather, the contrary was the case), while infectious disease mortality decreased considerably. Housing remained in very short supply for years, and linen was certainly not restocked overnight. The return of thousands of Dutch workers from Germany and the immigration of 110,000 people from the Dutch Indies further added to the overcrowding that marked the late 1940s and much of the early 1950s.\textsuperscript{370} The second criterion for judging the merit of the explanation – that of explaining age distribution – is not met either. There is no obvious reason whatsoever to assume that the danger of contracting an infectious disease through domestic overcrowding is much greater for children and adolescents than it is for adults.

Finally, the overcrowding thesis completely fails to explain the difference between Denmark and the Netherlands. The housing shortage in Denmark, as noted in Chapter 4, was hardly less pressing than it was in the Netherlands. Fuel shortages were rampant in both countries, as was the tendency among the urban poor to sell some of their allotment of fuel. The textile situation in Denmark was perhaps better in the last two years of the occupation, but hardly so in earlier years. While there can of course be no doubt that overcrowding and the movement of people did contribute to infections in individual cases, these effects were not quite extreme enough to explain

\textsuperscript{369} Klemann, Nederland, 487.

\textsuperscript{370} M. Bossenbroek, De Meelstreep (Amsterdam 2001) 175.
the remarkable divergence between the mortality regime in the two countries. Neither movement nor overcrowding increased the risks of propagation to such an extent that the different Dutch and Danish mortality regimes can be explained by it.

**Personal and domestic hygiene**

As noted in Chapter 5, the workload of Dutch housewives increased considerably during the occupation, as queuing, mending clothes and other war-related tasks very largely fell upon them. Domestic care may well have suffered as a result. The shortage of soap, detergents and fuel for heating water could have caused a sharp decline in hygienic standards. On the other hand, many housewives appear to have coped with the restraints and shortages quite well. Alternative modes of cleaning – that is, the use of either old-fashioned sand or the newly introduced synthetic detergents – seem to have been adopted quite readily.\(^{371}\) The smell of soap, the glimmer of floor wax and many other relative luxuries were dearly missed, but a dangerous decline in domestic hygiene is not all that likely to have taken place.

Domestic hygiene in the Netherlands may well have been compromised, but so too, of course, was domestic hygiene in Denmark. Queuing and other war-related chores were no less the order of the day there than they were in the Netherlands, and in Denmark too traditional products for housekeeping all but vanished from the shops. It is impossible, of course, to investigate and compare attitudes to hygiene and housekeeping in Denmark and the Netherlands, but there certainly is no reason to assume that the reaction in the former country was fundamentally different from that in the latter country. There is little ground to believe that domestic hygiene played a very significant role either in the changed mortality regime in the Netherlands or in the absence of such changes from Denmark.

Personal hygiene is a wholly different matter. While the lack of soap, hot water and bedding in Denmark and the Netherlands may not have had a very great impact on domestic hygiene, it may have had a far greater impact on personal hygiene. Bodily cleanliness is important, and where it is lacking, infectious disease may well rise. Moreover, there are clear indicators that domestic hygiene did fall. The incidence of lice and scabies, for example, which could be an indication of hygienic

\(^{371}\) See above, page 125
practices, increased sharply in both countries. A truly massive outbreak of these parasites struck the Netherlands during the Hunger winter, but before 1944 scabies and lice incidence had also increased considerably. It has been reported that immediately after liberation, up to half of the population of the western Netherlands was infested with lice, a token of the dramatic impoverishment during those last months of the occupation.\textsuperscript{372}

There appear to be two reasons why lice infestations increased in the Netherlands after the German invasion. In the first place, the preventive measures against lice (e.g. frequent soap use and changes of clothes) were hindered by shortages of soap, fuel and textiles. In the second place, the treatment normally administered to those suffering from lice was hindered by a shortage of the alcohol and chemical agents that are required to kill lice, as well as of the steel combs that are needed to comb out the hair of sufferers.\textsuperscript{373} In Denmark, the incidence of lice likewise increased (although Denmark could always muster sufficient alcohol for treatment) and lice became one of the problems on which the public health authorities focused. Although some schools were equipped with baths to combat the worst of the epidemic, it could hardly be contained. In 1942, a law was passed in Denmark making the treatment of any lice infestation mandatory.\textsuperscript{374} The reporting of lice, however, was not mandatory in either of the countries, and because treatment was often administered outside the medical circuit, no reliable quantitative data on lice incidence have survived.

Slightly more is known about scabies, a rather more unpleasant affliction caused by the mite \textit{Sarcoptes scabei}. Like lice, scabies incidence increased spectacularly during the occupation. In his 1946 study of scabies, the Danish medic Bjørn Heilesen hailed the ‘excellent opportunity’ afforded him by the circumstances of war to instigate a large-scale investigation of the parasite in 1942-43.\textsuperscript{375} While it may well have been an excellent opportunity for him, to the people who fell victim to scabies, it was a pest. In both Denmark and the Netherlands, some national data on

\textsuperscript{372} Red Cross, \textit{Onderzoek}.
\textsuperscript{373} J.J. Zoon, ‘Huid en geslachtsziekten’ in: Boerema, \textit{Medische ervaringen} 469.
\textsuperscript{374} Knud Kristensen, ‘Den tyske besættelse’ in: \textit{Indenrigsministeriet, Indenrigsministeriet 1848-1998}.
\textsuperscript{375} B. Heilesen, Studies on Acarus Scabiei and Scabies (Copenhagen 1946).
scabies incidence survive, although these cannot necessarily be compared. In the first place, the disease, though highly irritating, can be lived with reasonably well, and people may have avoided seeing a medic who was able to report the disease.\footnote{376} Moreover, the collecting of scabies data began only late in the occupation in Denmark (after 1943), which may also have had a negative impact on reporting.\footnote{377} Even if the available data are considered merely an indication of the actual incidence, however, the increase in scabies during the occupation is nothing short of staggering. From a marginal affliction, scabies increased to epidemic dimensions, affecting at least 2-3\% of the Dutch and the Danish population, with a peak in the Netherlands of over 6\% in 1945.\footnote{378}

With all statistical caveats regarding reported scabies incidence, Denmark appears to have lagged slightly behind the Netherlands, with incidence hovering closer to 2\% than to 3\%. This would fit the assumed relation between soap and textile availability and scabies, because such shortages were also slightly more severe in the Netherlands than they were in Denmark. Yet there is another driving force behind the increase in scabies, especially in wartime. Scabies, although it can be transferred in a variety of ways, is today commonly considered a primarily sexually transmitted disease. The close skin contact that is part and parcel of all sexual intercourse offers \textit{Sarcoptes scabei} an excellent opportunity to spread to a new individual.\footnote{379} Although declining personal hygiene is likely to have contributed significantly to the spread of scabies, at least during the Hunger winter, the sexual transmission of infections undoubtedly played an important role as well, especially given the high incidence of sexually transmitted diseases (STDs) in both countries, which will be discussed in more detail below. The explosive increase in scabies need not mean that hygiene was necessarily dismal.

In so far as scabies and lice incidence can be used as an indicator of bad hygiene, there is no particularly stark difference between the two countries. The Netherlands may have been slightly harder hit (although the quality of data does not

\footnotetext{376}{Zoon, 'Huid en geslachtsziekten' 467, 468.}

\footnotetext{377}{DS, \textit{Statistisk Årbog} 1946.}

\footnotetext{378}{DS, \textit{Statistisk Årbog}, 1946; CBS, \textit{Statistisch Jaarboek} various issues.}

\footnotetext{379}{G.I. Levine, 'Sexually transmitted parasitic diseases' in: \textit{Primary Care} 18 (1991) 101-128.}
allow for great certainty in this respect) but the development of scabies was similar in both countries, namely a drastic (roughly tenfold) increase in the number of cases. Thus, lice and scabies incidence does not seem to be a particularly viable explanation for the observed difference between the two countries. Moreover, in the Netherlands neither scabies nor lice incidence declined very rapidly after liberation.\(^{380}\)

This does not mean that impaired hygiene due to soap shortages is to be ruled out. As said, scabies or lice incidence is not necessarily a good measure of hygiene, and there may well be an alternative measure of hygienic problems. As shown in Chapter 5, during part of the occupation the Danes had larger rations of organic soap than the Dutch did, and organic soaps were predominantly used for personal hygiene. Although soap as such has very limited antiseptic qualities, and is not really necessary for the maintenance of minimum hygienic standards, it has been shown to play an important role in maintaining such standards in certain cases, where it can have a marked impact on the incidence of a number of diseases, including enteritis, diarrhoea and dysentery, which were strongly on the rise in the occupied Netherlands.

The link between non-antiseptic soap use and infectious disease is believed to be related to the longer and more intense rinsing of the hands. Bacteria, which are likely to be present on hands, are spread easily through hand contact. Especially households that include infants and very young children are a source of risk; because parents inevitably touch the faeces of young children, it is essential that they wash their hands thoroughly afterwards to prevent the spread of infections. Likewise, handwashing after defecation bears a strong relation to the spread of infectious diseases, especially of the enteric diseases that killed so many young children in the Netherlands, but not in Denmark.\(^{381}\) The question remains, however, whether such dangerous consequences really did ensue in the Netherlands.


As is clear from the above, it is not soap as such that determines personal hygiene, but the behaviour related to it. Since soap quality (expressed as soap fatty acid content) declined far more than did soap availability (the number of bars of soap available), the effect could have been much less marked than has been presumed. Even hand-washing with substances other than soap – such as mud or ashes – has been shown to have effects very similar to those achieved with soap; hence, it is not necessarily the case that wartime soaps with their notoriously low content of soap fatty acids were not effective against the spread of infections via the hands.

The question, therefore, is whether hygienic behaviour (especially hand-washing) changed during the occupation. There is little or no documentary evidence that it did in either of the two countries. In the 1940s, most parents would have been acutely aware of the importance of hygiene for child survival and can safely be assumed to have done their best to achieve high hygienic standards. Moreover, babies – by far the main group at risk – were provided with extra soap rations, as were the people handling them, such as midwives and doctors. The relation between low soap availability and child mortality, then, is not immediately evident.

An alternative yardstick for measuring the impact of soap use on public health has been proposed by Curtis, Cairncross and Yonli, who believe that it is possible, on the basis of monthly infant mortality rates, to say more about the role of hand-washing in the spread of infectious disease. Both their own investigations and historical research suggest a strong link between hygiene and the seasonality of infant mortality. Infant mortality, as explained in Chapter 2, was in 25-40% of cases the result of enteritis and diarrhoea caused by either bacteria or viruses. Whereas bacteria can be effectively combated by hand-washing with soap and generally maintaining personal hygiene, viruses are largely unaffected by such measures. Hence, declining hygienic standards lead to a sharp increase only in bacterial diarrhoea; such increases occur predominantly during the summer, when bacteria

382. See page 126 above.
383. Centraal Distributiekantoor, Vademecum voor Distributiekantoren.
thrive as a result of higher temperatures. Viral diarrhoea, on the other hand, occurs predominantly during winter, when the relative proximity of people to one another facilitates its spread.

A decline in hand-washing practices, then, can be expected to result in the increased incidence of bacterial diarrhoea, and normally coincides with higher infant mortality during summer. As can be seen in figure 9.3, however, Dutch infant mortality was and remained relatively low during summer and high during winter. Although this should not be taken as definitive proof that a decline in hand-washing in the Netherlands did not take place, or had no significant effects, it is certainly a further indication that soap shortages had at most a very limited impact, and do not explain the divergence between Denmark and the Netherlands.

Figure 9.3: Monthly infant mortality per 10,000 in the Netherlands between the German invasion and the Hunger winter

![Graph showing monthly infant mortality per 10,000 in the Netherlands between the German invasion and the Hunger winter]

Sources: Boerema, Medische ervaring. See also Chapter 2.

Overall, the results of the above investigation of some of the main explanations for the increase in especially propagated diseases in the Netherlands gives little ground to accept this particular part of traditional explanations for the Dutch wartime mortality
regime. Neither the particularities of the Dutch mortality regime nor the difference from Denmark are explained to the expected extent by either increased human contact or declining hygiene. This leaves at least one traditional explanation: food safety.

**Food safety**

In some cases, there can be no doubt about the relation between a common-vehicle disease infection and wartime circumstances. This was particularly the case with illegally produced meat in the Netherlands. As noted in Chapter 8, meat was channelled into the black market in considerable quantities, not least during the Hunger winter. Black marketeers allegedly paid little attention to food safety. The clandestine slaughter of animals in sheds and barns by inexperienced butchers posed a clear and acute danger to public health, as the authorities did not tire of pointing out. Food-borne diseases – such as dysentery, typhoid fever and paratyphoid fever – killed considerably more people in the Netherlands during the occupation than they did before or after it, although, with the exception of a large outbreak of typhoid fever during the Hunger winter, these diseases were not very significant in the bigger picture. It should be noted, moreover, that the biggest killer during the occupation (TB) can also be spread by infected meat and milk. Before making the comparison with Denmark, it is worthwhile investigating the development over time of the diseases that are most clearly linked to, and hence can be considered reliable indicators of, lowered food safety in the Netherlands.

Paratyphoid fever mortality increased sharply in 1942, fell thereafter, and increased again in 1945. The first peak (albeit one of a mere sixteen fatalities) coincided neatly with the established peak in illegal slaughter. Paratyphoid fever is caused by the bacilli *Salmonella paratyphi*, which is food-borne and often related to the circumstances of the slaughter and processing of meat. After the major wave of illegal slaughter was over, paratyphoid fever dropped to prewar levels, only to return with a vengeance during the 1945 famine. At that point, some people were even scavenging the carcasses of animals that were lying in the fields – clearly an
invitation to disease.\textsuperscript{386} Typhoid fever, a more lethal disease than paratyphoid fever, carried off more people, especially during the Hunger winter. Typhoid fever, on the other hand, did not follow the pattern of illegal slaughter, killed considerably more people in 1943 than it did in 1942, and continued to increase in the two subsequent years. Interestingly, it affected primarily middle-aged people, that is, those in the 20-50 age group.

**Figure 9.4 Index of typhoid fever and paratyphoid fever mortality per 10,000 in the Netherlands (1938/39 =100)**

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<tr>
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<th>Typhoid fever</th>
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<td>1945</td>
<td>2436</td>
<td>319</td>
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<tr>
<td>1946</td>
<td>292</td>
<td>184</td>
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</tbody>
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*Source: see Chapter 3*

The fact that, unlike paratyphoid fever, typhoid fever and dysentery were not particularly lethal during 1942 does not as such rule out the possibility that compromised food safety influenced its spread, although it does make a direct link with illegally slaughtered animals less likely. Either the increased incidence of diseases was not directly caused by illegal slaughter (or not, at least, in a one-to-one relation), or the diseases may have become endemic after increasing along with the surge in illegal slaughter.

\textsuperscript{386} Kruijer, *Hongertochten.*
What is more interesting to our investigation is dysentery. Denmark suffered a sharp upturn in dysentery, although less than the Netherlands, but enough to make registration compulsory after 1942. Not only was the impact of dysentery less marked in Denmark than in the Netherlands, but it also affected a different age group. In the Netherlands, as said, children were affected rather greatly by the disease (over half its fatal victims were 18 or younger). In Denmark, this was not the case at all. The total number of casualties in this age group during the entire occupation stands at no more than twelve.

The comparison between Denmark and the Netherlands is a particularly viable one in the case of illegal slaughter as a possible cause of the spread of disease. In Denmark, as explained in Chapter 8, tens of thousands of tonnes of meat were produced and distributed through illegal channels. The example of the Houlberg case, where an entire illegal production line was closed down for reasons of food safety, is a case in point: the problem of declining food safety clearly was affecting Denmark to a considerable extent.\(^\text{387}\) Typhoid fever and paratyphoid fever likewise were on the rise. Paratyphoid fever – the disease most easily linked to food safety in the Netherlands – in fact increased in Denmark in a similar fashion as in the Netherlands, peaking in 1942 with four and in 1945 with nine fatal victims.\(^\text{388}\) These cases are interesting but, because of their limited number, not particularly revealing. These are hardly the statistical data on which to base a nationwide investigation. On the other hand, the very fact that such clearly food-borne, common-vehicle diseases as paratyphoid fever claimed so few lives in both countries is perhaps sufficient evidence that the solution to the mystery – namely whether it was a matter of Danish health or of Dutch ill-health – is not to be found here.

**Impaired immunity**

There is no doubt that, for a variety of reasons, the risk of contracting certain diseases was higher in the occupied Netherlands than it was in peacetime, and that in the Danish case this was not the case. On the other hand, the differences in infection hazard come nowhere near to explaining the observed divergence between

\(^{387}\) Kjersgaard, *Danmark* (vol. 2) 128.

\(^{388}\) Sundhedsstyrelsen, *Dødelighed og dødsårsager i Danmark*, various issues.
Denmark and the Netherlands. It is highly unlikely that such factors as the decline in hygiene, the closer proximity of people to one another and the lack of soap could have played a very important role in the Netherlands before the Hunger winter if they did not in Denmark. These explanations all fail to meet the three requirements for explaining Dutch wartime mortality: it is unclear why such developments would have affected the young much more than the older people; it is unclear why their deadly influence ended abruptly after liberation; and it is unclear why Denmark escaped relatively unscathed. Neither separately nor in combination do these explanations solve the mystery of the dying Dutch.

But what if people, and especially young people, in the Netherlands suffered impaired immunity and were therefore more vulnerable than their Danish peers to the dangerous circumstances brought about by the occupation? Impaired immunity as an explanation for wartime Dutch mortality has much to recommend it. If the infection hazard in the two countries was similar – which is the impression one gets from studying the above investigation – one must suspect that the Dutch were physically more vulnerable to similar circumstances. To date, three possible causes of impaired immunity have been pointed out. In the first place, there is the recently raised view that immunity may have been impaired by an unidentified sexually transmitted disease. A second possibility is that the stress caused by the occupation had a negative impact on immunity. Finally, there is the possibility that the prevailing diet in the Netherlands somehow compromised immunity.

**VD: the key to TB susceptibility?**

In a recent letter to *Emerging Infectious Diseases*, Nagelkerke and colleagues suggest a link between an unidentified STD and susceptibility to TB. Research into other periods and populations, they believe, points towards a relation between sexual behaviour and TB susceptibility. As shown in Chapter 2, TB in the occupied Netherlands affected primarily teenagers and young adults. Their increased susceptibility to TB coincided with a very marked upsurge in such STDs as

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gonorrhoea and syphilis in (roughly) that age group. The theory proposed by Nagelkerke and colleagues is that another, undetected, STD – for example, a herpes virus – likewise became widespread and impaired the body’s resistance against such infectious agents as *Mycobacterium tuberculosis*. Of course, this theory cannot explain all of the observed changes in the mortality regime in the occupied Netherlands, but it could help to explain an important part of the increase in infectious disease mortality.

This explanation, however, has a number of weaknesses. In the first place, STD incidence increased sharply in both the Netherlands and Denmark, and was very predominantly spread by a similar population of infected individuals, namely German military personnel.³⁹⁰ Although one can safely assume that the same unidentified STD would have spread in Denmark as well, TB mortality did not increase there. A second argument against an STD as an explanation is that while TB affected young males somewhat more than females, wartime STDs disproportionally affected young females.³⁹¹ The sex-specific increase in STDs is itself easily explained: women contracted STDs from German soldiers, who were not registered in national disease statistics in either Denmark or the Netherlands. Consequently, the increase in the number of registered cases of STDs in both countries very predominantly affected young women, a group that is not nearly as well represented among indirect civilian TB deaths as young men are. This does not necessarily prove that there was no link between TB and STDs, but it does make it highly unlikely that the effect of STDs was very conducive to the spread of TB in the Netherlands.

Finally, it is questionable whether the rapid decline in TB mortality after liberation is fully compatible with this theory. The replacement of German troops with Allied troops if anything gave an impetus to increased promiscuity, as illustrated by the now famous lines written by the Dutch poet Campert: ‘Everything boozed and screwed/ Europe was one big mattress’.³⁹² Deaths due to syphilis did decline

somewhat, but STD incidence remained relatively high. It is unlikely that the pathogen allegedly responsible for increased TB infections would have disappeared so readily from the 'big mattress' that liberated Europe appears to have been.

**Stress**

Another suggestion (one popular among contemporary doctors) is that stress contributed a great deal to the vulnerability of the Dutch population to infectious diseases.\(^3\)\(^9\)\(^3\) There indeed is ample evidence that stress can compromise the body's ability to fend off disease, although much remains unknown about the precise mechanisms behind it or about their precise impact.\(^3\)\(^9\)\(^4\) Obviously, the German occupation was a source of increased stress for the people of the Netherlands, especially as the occupation regime became increasingly repressive over the years. Executions, disappearances and bombardments, even though they affected only a relatively small group of people directly, were the order of the day during the later years of the occupation in the Netherlands. It is hard to imagine such circumstances not being stressful.

However, one should wonder why young people would be affected much more strongly by such stressful circumstances than their parents, although it is conceivable that the latter suffered more heart attacks as a result of stress.\(^3\)\(^9\)\(^5\) The greatest problem with stress as an explanatory variable, again, is that wartime stress was far from absent in Denmark. The occupation regime in Denmark was undeniably milder and the country was not subjected to extensive bombardments, but it certainly was not stress-free. The fact that Denmark came to the verge of civil war in 1943 should have had an impact on levels of stress among the populace, at least in urban areas. Occupied Denmark, however well it may have fared in comparison with other countries, was a violent, militarized and highly criminal society, with very dire prospects for the immediate future. Stress, although perhaps a small contributor to

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the mortality regime in Denmark and the Netherlands, can thus not explain the significant difference between the two countries.

Quantitative and qualitative malnutrition
The fictitious detective Sherlock Holmes stated in a number of passages that are often (and perhaps all too eagerly) quoted by scientists, that 'when you have eliminated the impossible, whatever remains, however improbable, must be the truth'. Having discarded the other explanations, the diet of the Dutch stands out as the remaining explanation. There are two reasons for this, namely because it changed drastically during the war years and because no similar development took place in Denmark. That said, there are two caveats concerning Holmes' methodology.

In the first place, the method relies on testing all conceivable explanations and being left with only one. In the case at hand, however, where a very complex phenomenon is to be explained, it is impossible to guarantee that all explanations have been investigated. A second problem inherent in Holmes' research methodology is that a false explanation may be impossible to prove or falsify. This is not the first study, moreover, to be driven in this manner to a food-centred explanation of patterns of mortality. Thomas McKeown's seminal study The Modern Rise of Population likewise reaches the conclusion that dietary changes were the prime cause of lowered mortality (and indeed, quotes Sherlock Holmes). As discussions since 1976 have revealed, this is a slippery slope for a researcher to tread. Before accepting, merely on the basis of the comparison between two countries, that dietary differences between Denmark and the Netherlands caused the divergence in mortality rates, further evidence is needed – especially because there has been extensive research into Dutch wartime diets that has led to exactly the opposite conclusion, namely that the Dutch diet was certainly adequate and possibly

an improvement over the diet consumed by many during the 1930s. Since the long-standing myth that the Dutch had faced persistent famine during the entire occupation period was debunked by Gerard Trienekens in 1985, Dutch historiography has been dominated by an optimistic view of wartime nutrition. Trienekens showed that the calorific value of the Dutch diet certainly had been sufficient to avoid starvation before September 1944. Because the consumption of vegetables and fibres increased and that of saturated fats decreased, Klemann maintains that the changed diet during the occupation was, from a strictly biological perspective, an improvement rather than a setback. 398

Could something have been wrong with the Dutch diet? Judging by modern dietary advice, it was indeed in many respects healthier than the diet consumed by the Danes. The fatty diet prevalent in Denmark, where adult males routinely ate between 3500 and 4000 kcal per day, would not be considered healthy today. Before the occupation of their country, the Dutch had been eating much the same, probably to the detriment of their health. 399 Some improvements indeed were notable during the war years: as quoted above, at least one retirement home director believed that his heart patients were benefiting a great deal from the dietary changes forced upon them. 400 Although the overall number of recorded victims of cardiovascular disease increased slightly, he was in all likelihood right. The Dutch, at least until the famine winter, consumed a diet that was quite in keeping with present-day dietary advice. What constitutes a healthy diet under difficult circumstances may well be complicated. Importantly, new research in the developing world suggests a strong link between diets and immunity – a relation that may be much stronger than has long been supposed.

Here too, however, problems arise. Even in contemporary research, investigations of diets and the relations between nutrition and health suffer from serious problems in gathering and interpreting data. To roughly sketch the extent of these problems: it is unclear what people eat, it is unclear how well their bodies

398. Klemann, Nederland 454.
399. CBS, Huishoudrekeningen van 598 gezinnen; Bureau van Statistiek der Gemeente Amsterdam, Huishoudrekeningen van 212 gezinnen uit verschillende kringen der bevolking.
400. See page 116.
absorb nutrients from their diet, and it is not known exactly what quantities of various nutrients people need. In historical research, these problems are far worse. The majority of the people who were alive during the occupation are now dead, and those who are still alive cannot be expected to have an accurate memory of the day-to-day eating habits of over six decades ago. The impact of the war years – or rather of the Hunger winter – on long-term health have been investigated, but such investigations are neither feasible in the case at hand nor can they be expected on the basis of previous experience to yield results that are usable for our goals. That is not to say, however, that a serious investigation of Dutch wartime nutrition is not possible. As demonstrated in Chapters 4 and 8, reasonably precise estimates can be made of the amounts of food eaten in the Netherlands and of the changes brought about by the circumstances of occupation.

Food availability
As explained in Chapter 4, the diet that was available to Dutch consumers during the Second World War differed considerably from the diet they had consumed before the war. To briefly reiterate the findings of Chapter 4, there was a significant increase in the consumption of a number of foodstuffs, notably potatoes, cereals, pulses, vegetables and butter. The consumption of other foodstuffs – especially meats, margarine, lard and cheese – declined. Although the resulting diet was, in calorific terms, considerably smaller than the prewar diet, the most important change was the shift away from animal-source foods. The diet of the Dutch came to consist primarily of bulky, starchy foods with a low fat content. The Dutch before 1944 averted starvation by consuming 1600-1700 calories worth of potatoes, bread and pulses per AME. This was not, as noted, the diet most to the taste of the Dutch, but it was certainly a great deal more pleasant than starvation.

Before delving into the potential dangers of the Dutch wartime diet, it is worth confronting these findings with another of the criteria for an explanation of wartime mortality. The Dutch diet possibly could explain the wartime ill-health of the Dutch if it

changed radically not only after the German invasion but also after liberation. In other words, did the Allied forces liberate the Netherlands not only from political and military oppression but also from a deficient diet? The Allies certainly appear to have tried: arriving in a country heavily affected by famine, it was immediately clear to the SHAEF that providing the liberated Dutch with food provisions had top priority. Taking into account the ravished state of Europe, and especially of Germany, G-5/CA (the Supply and Economics Sector) worked nothing short of a miracle in restoring food supplies in the Netherlands. Of course, the success of the Allies in overcoming the food problems that threatened the Dutch owed much to the availability of an intact bureaucratic structure for the allocation of foodstuffs.

Food had to be, and was, shipped to the Netherlands over long distances. This was no mean feat, given the shortage of transportation capacity at the time. This lack of sufficient tonnage, however, had important implications for the kind of food that was imported. Plant-source products may have the great advantage that their calorific value per acre is much higher than that of animal-source foodstuffs, but when transporting food, the exact reverse is the most efficient. Plant-source foodstuffs usually contain far fewer calories relative to their volume than do animal-source foodstuffs, so it is hardly surprising that the Allies’ food landings comprised a relatively large proportion of compact, animal-source products. The condensed milk and corned beef the liberators brought with them were to loom large in the war memories of the wartime generations. Still, most of the almost 600,000 tonnes of food brought in by the Allies before September 1945 was not animal-source food: half of it was flour, and only some 10% was animal-source food – predominantly corned beef and condensed milk. In calorific terms, however, the share of animal-source food was of course far greater.

Moreover, these foodstuffs were delivered primarily to the areas that could not produce them themselves in sufficient quantities (very predominantly the urbanized west), and were doled out primarily to those most affected by shortages, and especially to children. The impact of food provisions on nutrition immediately after liberation was hence greater than total imports may suggest (even though meat imports alone amounted to over three kilograms per capita). As explained in

Chapter 3, after the initial turmoil of war had settled the provision of animal-source foodstuffs was quickly stepped up again, exceeding war levels already in the course of 1946, and restoring prewar consumption of animal-source foodstuffs as early as 1947. The combination of extensive food aid, proactive policy making and, eventually, Marshall Aid had allowed a remarkably rapid return to a relatively rich diet. 403

Availability and consumption

However, this leaves the question how the changes in total food availability in the Netherlands affected consumption on an individual level. As noted, food inequality increased in the Netherlands during the war years, so that changes in the overall availability of food are only moderately representative of consumption on the household level. Despite rationing, it is difficult to reconstruct how much households consumed. As explained, some people in the Netherlands substituted expensive foods with cheaper ones (in fact, it is probable that many of the Dutch did so). It is impossible to establish, however, how much of which foods these people were eating. What can be said on the basis of the available data is that the general trend towards a more plant-based diet could be amplified by low incomes or mitigated by high incomes. Low-income households ate more potatoes, pulses and other bulky plant-based foodstuffs and fewer fatty and animal-source foods, while people working in agriculture and those with a higher income had more opportunities to maintain a diet similar to the one they ate before the war.

In addition to the problems of measuring actual as opposed to official household consumption, it is quite impossible to measure the consumption by individual family members. Men, in many cases, received a relatively large share of the available foodstuffs because of their extra rations and because many employers instituted company kitchens. According to many contemporary observers, men had an advantage within households in terms of both the quantity and the quality of food they consumed in comparison with other family members. Although the example of men eating an entire family's cheese ration (as in the case mentioned by the social

403. See page 49 above.
worker quoted in Chapter 4) may not have been representative of men in general, it is clear that there were problems with the allocation of food within families.

Because of these problems, rations are not a reliable basis on which to investigate diets in the occupied Netherlands (nor, by the way, in Denmark), especially because the coupon system, even if people adhered to its regulations, left some leeway for variation. For example, it is beyond dispute that vegetables were consumed in greater quantities than before, but which vegetables were consumed in which families is impossible to reconstruct. Despite all these caveats, the general trend in Dutch nutrition is evident: the diet became plant-based, lean and quantitatively on the small side. The precise impact thereof on a household or an individual level, however, cannot be reconstructed with such precision. Thus, to investigate the impact of nutritional change, other indicators must be investigated.

**The medical impact**

The most obvious medical consequences of an insufficient diet are oedema and, eventually, starvation. Such problems were of course common in the western Dutch cities during the Hunger winter, but extremely rare before that. This confirms that hunger, in the quantitative sense of the word, was almost unheard of in the Netherlands before 1944. There is, however, more to nutrition than merely eating sufficient calories to avoid starvation. It is likewise important to consume a range of nutrients, including such macronutrients as protein, fat and carbohydrates and such micronutrients as vitamins and minerals. Because of the strong, but still largely circumstantial, evidence that the Dutch diet was less conducive to maintaining a high level of immunity than the Danish diet, it is worth investigating nutrient absorption in the Netherlands more closely.

The obvious disease to use as an indicator of qualitative malnutrition is rickets. Rickets is primarily a bone disease, caused by insufficient calcium absorption by the bone, usually as a consequence of vitamin D deficiency. Before the war, cod-liver oil and fortified margarine had contributed to the vitamin D absorption of Dutch children, especially during winter. A diet low in fish, eggs and dairy products, as consumed during the occupation of the Netherlands, may not have been sufficient to ensure a sufficient absorption of vitamin D. With sufficient sunlight, the body can make vitamin D, but that is obviously a seasonally fluctuating source. In the occupied Netherlands,
rickets initially increased, which led to the government decision to supplement the intake of vitamin D by distributing vitamin D tablets in schools, after which rickets incidence remained at a moderate level. Rickets is the only example of a micronutrient-deficiency disease for which there are good data; however, the data may not reveal very much about the changes in the diet. Before the occupation, vitamin D absorption was artificially increased through the widespread consumption of cod-liver oil, while during the occupation it was supplemented in tablet form. Because of these different supplementation regimes, little can be said about the impact of the base diet on rickets. The initial increase constitutes only weak evidence that the diet deteriorated, because it is also the period during which there was no artificial supplementation.\textsuperscript{404}

**Figure 9.3: Rickets mortality in the Netherlands, per 10,000, 1938-48**

\begin{center}
\includegraphics[width=0.5\textwidth]{rickets_mortality.png}
\end{center}

*Source: see figure 3.3*

Several other diseases are caused by shortages of specific micronutrients, such as beriberi (insufficient vitamin B1), scurvy (insufficient vitamin C) and pellagra (insufficient niacin). However, these are not useful as marker diseases to identify nutritional deficiencies in the Netherlands. Beriberi and pellagra occur only when shortages are extreme, and neither disease was common in the occupied

\textsuperscript{404} Verslagen en mededelingen betreffende de volksgezondheid (1944-1945) 846.
Netherlands. Scurvy does not appear to have occurred in the Netherlands, which is not surprising considering the occupation was a period of high vegetable and potato consumption. Whatever was ailin the Dutch, it was not a shortage of vitamin C.

However, the absence of deficiency diseases does not mean that deficiencies did not occur – only that they were not extreme. To illustrate this, the fact that scurvy is a highly uncommon disease in Europe today is no reason to suppose that all Europeans consume sufficient vitamin C. The contrary is in fact true. Long before deficiency diseases occur, health can be compromised by an insufficient intake of nutrients in less obvious manners. Subclinical deficiencies (deficiencies that do not manifest themselves through clear disease symptoms) are in fact a grave medical problem – one, notably, that is known to affect immunity.

In the past decade, the relation between diets and immunity has attracted considerable attention from nutritionists and epidemiologists, especially those among them who take an interest in developing countries. Since the 1960s, many developing countries have made great strides towards eradicating the quantitative malnourishment that used to plague them. The ‘Green Revolution’ – which enabled many farmers in developing countries to increase yields from arable farming – was instrumental in this development: by more efficiently producing plant-source foods, many countries could (and can) feed their populations on largely indigenous production.\(^{405}\) However great the merit of eradicating hunger in this and other ways may be, the improvements in public health have in many cases been somewhat disappointing. Especially the incidence of infectious diseases among children, and consequent premature mortality, has in many cases remained rather high.\(^{406}\)

The apparent persistence of qualitative malnutrition after the eradication of quantitative malnutrition has triggered a wave of more detailed research into nutrition and health in developing countries. From the mid 1980s onwards, the composition of the diet in many of these countries was investigated in relation to the health problems plaguing especially the young, because child growth, mental development and


immunity were not measuring up to expectations. The nutritional deficiency underlying many of these health problems, which is now held responsible for literally millions of deaths in developing countries each year, was found to be subclinical or mild micronutrient deficiency. A large number of chemicals that are of crucial importance to immunity, such as retinol, zinc and selenium, are not absorbed in sufficient quantities from the diets prevailing in much of the world, even though these diets may be quantitatively sufficient. Many micronutrients are difficult (and in some cases, impossible) to absorb from plant-source foods such as grains and cereals, precisely the staple foods of many people in post-Green Revolution developing countries. Because some of these micronutrients are indispensable for child growth, cognitive development and immune systems, the relatively low intake of animal-source foods is directly related to impaired development and to a relatively high incidence of infectious disease and child mortality. It should be noted that micronutrients had already been known for decades and were therefore not a new discovery. Yet there had been little awareness, first, that a relatively mild deficiency can have a detrimental effect on health and, secondly, that the human body has difficulties in absorbing micronutrients from certain kinds of food.407

As the disastrous consequences of even mild micronutrient deficiencies on child health and survival became evident, drastic changes in policies regarding economic development and public health ensued. The 2003 UNICEF Progress Report, Vitamin and Mineral Deficiency, to give one prominent example, outlines not only the enormous scope of the problem of micronutrient deficiency, but also places food fortification firmly among the main priorities for human development in the coming decade. Other international organizations have likewise shifted both their attention and much of their budget towards relieving micronutrient malnutrition, which has been estimated to kill each year millions of people, very predominantly children in developing nations.408

These findings have an obvious bearing on the question at hand. In Denmark, where the diet did not change significantly, immunity was not compromised, whereas

in the Netherlands, where the diet changed towards plant-source foods, people suffered a marked decline in immunity. Moreover, a nutritional explanation would answer not only the comparative question: the other two criteria — namely the rapid improvement of Dutch health after liberation and the remarkable age-differences in infectious disease vulnerability — are likewise met. The fact that postwar diets in the Netherlands were not only quantitatively richer but also contained significantly more animal-source products (not least because of the imported corned beef and condensed milk) would explain the rapid decline in Dutch infectious disease mortality. The greater sensibility of children and adolescents is likewise in keeping with the hypothesis that subclinical micronutrient deficiencies were the driving force behind the increase in infectious disease mortality in the Netherlands.

**Orphan blood**

Subclinical micronutrient deficiencies provide an explanation that fits all three criteria for solving the comparative puzzle of Dutch and Danish wartime mortality. Doing so, however, amounts to blaming a considerable epidemiological phenomenon on a by and large unseen nutritional cause. These are, after all, subclinical deficiencies — deficiencies that do not clearly manifest themselves. In the methodology of Sherlock Holmes ("whatever remains, however improbable, must be the truth"), this is hardly a problem, but in the case at hand it is. Further evidence of the mysterious causes of wartime ill-health — most notably a way of measuring actual micronutrient absorption — would certainly be welcome.

In both Denmark and the Netherlands at the time, researchers were likewise keen to have more detailed information, and thus initiatives were taken to monitor the development of public health. Of course, researchers at the time lacked many of the modern insights into immunology and nutrition, but they did collect data. As mentioned, in its investigation of schoolchildren in Copenhagen, the EHN failed to find significant changes in the physical state of children, other than the presence of lice and the absence of cleanliness. It should be added, however, that their investigations involved few subjects and were of a highly provisional nature. Perhaps
this is not much of a problem: on the basis of mortality statistics and dietary data, there is little ground to assume that Danish children were adversely affected.\textsuperscript{409}

In the Netherlands, larger, longer and more thorough investigations were undertaken by the Polscommissie. Considering the grave responsibility for nutrition they had assumed, the Dutch food authorities had good reason to measure the impact of their policies on public health. However, they were hindered by considerable difficulties in finding people willing to collaborate with their investigations. Officials found it nigh impossible to find a sufficient number of people willing to submit to medical check-ups to be able to effectively monitor the impact of the wartime diet. When they did manage to find volunteers, they were all too often relatively wealthy, middle-class people, in whom the officials were not primarily interested. The less affluent proved highly (and quite understandably) suspicious of government officials, especially when asked questions about diet and household economics. It proved impossible to find large numbers of working-class families willing to undergo medical investigations as guinea pigs for the food authorities.\textsuperscript{410}

However, a solution was at hand. Orphanages housed sizeable populations of children who were not in a position to refuse to participate in an investigation. Orphanages were all the more interesting because their budget usually did not allow them to make extensive black market purchases, and the diets they provided to the children were roughly equal to rations. Between the spring of 1941 and the spring of 1943, several orphanages were investigated in addition to (predominantly) middle-class families. In two investigations (February–March 1941, and March–October 1942), 3400 orphans and 1400 other children were medically investigated. The time span of these investigations was brief, and the results do not allow for a comparison of wartime medical status with the prewar and postwar periods. On their own, however, the results were worrying enough.

As was to be expected, both the children who were still living with their families and the children in orphanages lost weight. The shift away from the fatty prewar diet could not have failed to impact on children’s build, especially that of the chubbier ones among them. Here, the body mass index (BMI) of the investigated populations

\textsuperscript{409. RA, EHN; RA, DIV, EHN.}

\textsuperscript{410.NA, Archief gezondheidsraad 1920-1956, 445.}
of children has been calculated on the basis of measurements by the Polscommissie. BMI is not the ideal measure to investigate physical stature. Given the available data, however, the outcomes at least provide an insight into the stature of wartime Dutch children. As can be seen in figure 9.4 a and b, in which the current Dutch norms for healthy BMIs are also displayed, the average BMI in the investigated populations was clearly on the low side, but not worryingly so.

Figure 9.4 a: BMI of girls in orphanages and families, the Netherlands, February-March 1941 and March–October 1942, compared with current Dutch minimum and maximum norms
Figure 9.4 b: BMI of boys in orphanages and families, the Netherlands, February–March 1941 and March–October 1942, compared with current Dutch minimum and maximum norms

Neither group of children showed overwhelming signs of wasting, as indeed was to be expected on the basis of the data presented in Chapter 4. They were thin – thinner than children on average had been before the war – but that alone was not enough to worry researchers too much. More disturbing, they felt, was the development of height. Between the two periods of investigation, the average height for age of both orphans and other children declined by some 6 mm, which was, given the short time span of the investigation, not particularly much, but it did mark a departure from the trend of the 1930s, which had seen steadily increasing growth,

Source: NA, Archief gezondheidsraad 1920-1956, 445; www.voedingscentrum.nl

despite the Great Depression. In addition to this finding, a marked gap was developing between the heights of children in institutions and those of children living with their families. The average height for age orphans was more than 3 cm less than that of their peers who were still living with families (3.3 cm for boys, 3.4 cm for girls). Within the relatively brief period the investigation lasted, this difference increased by more than a centimetre (4.3 cm for boys, 4.8 cm for girls). One should be careful in assessing these data, however. The increase may well have been caused by the much smaller sample of non-orphaned children investigated in the second sample. Moreover, most orphans are likely to have had a less than ideal life before entering an institution.

Dutch food researchers, understandably, were not satisfied with their large amount of but relatively rough anthropometric data. The loss of weight and the evidence of slight stunting gave grounds for concern, but were, and remain, difficult to interpret because of the short time span of the investigation. To better understand the relations between nutrition and health, a large investigation of blood sampling was instigated. This was a cumbersome affair, as transporting medical equipment and blood samples necessitated the use of a car, for which fuel was often lacking. People were even less keen to be punctured (or rather, to have their children punctured) than they were to be measured and weighed. In the first two series of investigations (March–November 1941, and March–December 1942), several hundred non-institutionalized children were investigated, but when a new investigation was started in February 1943, there were only 17 volunteers. Children living in institutions, again, were easier to investigate. In the course of the three investigations, over 2000 blood samples were taken.

For the most part, the outcomes of these investigations were actually reassuring. Levels of vitamin C had been found, unsurprisingly, to be high. Carotenoids were high, as was to be expected, because carotenes are absorbed well from plant-source foods. Haemoglobin was not high (typically between 12-14 g per

413. NA, Archief gezondheidsraad 1920-1956, 445 21
Dl), but not dangerously low.\footnote{NA, Archief gezondheidsraad 1920-1956, 44525} This suggests that iron intake was reasonable, a fact probably attributable to the high consumption of pulses and other iron-rich plant-based foods.\footnote{FAO/WHO expert consultation on human vitamin and mineral requirements, 195-221} Overall, the outcomes of the blood tests were rosier that had been anticipated – except when it came to vitamin A. Much to the distress of food officials, vitamin A was and remained extremely low.

The norms are more or less arbitrary, but people are currently considered to have a subclinical shortage of vitamin A if their serum level of retinol falls below 20 μgram/Dl, and are considered seriously deficient if the level is below 10 μgram/Dl.\footnote{FAO/WHO expert consultation on human vitamin and mineral requirements, 87-102} Among the orphans in the Dutch sample, the average serum retinol was a mere 16 μgram/Dl and among the other children only 15 μgram/Dl. Regrettably, only aggregated data remain, but these, as shown in figure 9.5, paint a picture of a population seriously deficient in vitamin A.
Figure 9.5 a: Serum retinol (μgram/DL) in the Netherlands, orphans, 1941-1943

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<tr>
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Figure 9.5 b: Serum retinol (μgram/DL) in the Netherlands, other children, 1941-1943

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<td>July/Aug.</td>
<td>41</td>
<td>18</td>
<td>120</td>
</tr>
<tr>
<td>Sept.</td>
<td>53</td>
<td>74</td>
<td>19</td>
</tr>
<tr>
<td>Oct.</td>
<td>45</td>
<td>65</td>
<td>24</td>
</tr>
<tr>
<td>Nov.</td>
<td>82</td>
<td>77</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>248</td>
<td>427</td>
<td>97</td>
</tr>
</tbody>
</table>

| 1942  |     |    |     |    |     |    |
| Feb.  | 26 | 76 | 8   | 24 | 0   | 0  |
| March | 8  | 42 | 11  | 58 | 0   | 0  |
| April | 40 | 44 | 45  | 50 | 5   | 6  |
| May   | 13 | 12 | 89  | 81 | 8   | 7  |
| June  | 2  | 3  | 53  | 90 | 4   | 7  |
| July  | 11 | 13 | 71  | 87 | 0   | 0  |
| August| 1  | 4  | 24  | 92 | 1   | 4  |
| Oct.  | 2  | 25 | 6   | 75 | 0   | 0  |
| Nov.  | 2  | 22 | 7   | 78 | 0   | 0  |
| **Total** | 31 | 250 | 13 |


The reason for including these rather extensive tables is that they reveal more than merely the existence of severe vitamin A shortages among Dutch youths. They also
show, firstly, that data were collected over relatively long periods and with considerable intervals. Because they were also collected in various parts of the Netherlands, considerable differences could exist between local circumstances. In addition, there appears to be a seasonal component in these data, with considerably higher retinol levels in summer than in winter. That, however, does not change the fact that vitamin A deficiencies were widespread and quite severe in the occupied Netherlands.

Can such deficiencies explain the development of infectious disease mortality? Vitamin A plays an important role in a number of physical processes, not all of which are necessarily positive. For example, high vitamin A consumption by pregnant women has been linked to stillbirths and certain birth defects. Inuit peoples of the arctic – who have the highest vitamin A consumption in the world – have even been reported to fall victim to bouts of vitamin A induced insanity (Pibilokoq).\textsuperscript{417} But just as too much vitamin A can have disastrous consequences, so can deficiencies. In extreme cases, deficiencies can lead to blindness, while in milder (and more common) cases, it can cause night-blindness in children and women (especially pregnant women).\textsuperscript{418}

Over the past decade, not only the widespread shortages of vitamin A but also the relation between this vitamin and the human immune system have been increasingly recognized. Vitamin A supplementation, to name one relatively well-researched effect, has been proven to play a role in the prevention of and recovery from diarrhoea, especially among infants. Moreover, measles has been proven to be promoted by vitamin A deficiency. More generally (and unsurprisingly, given the aforementioned finding), vitamin A deficient infants and young children suffer a significantly higher infectious disease mortality than do their non-deficient peers. In adults, the impact of vitamin A deficiency, either mild or severe, is not yet entirely clear, but appears to be much less marked.\textsuperscript{419}

\textsuperscript{417} Landy D., 'Pibilokoq (hysteria) and Inuit nutrition: possible implication of hypervitaminosis A', in: Social Science and Medicine 21 (1985) 173-185.

\textsuperscript{418} K.P. West, 'Extent of Vitamin A Deficiency among Preschool Children and Women of Reproductive Age' in: Journal of Nutrition 132 (2002) 2857S-2866S.

\textsuperscript{419} M.L. Barreto et al., 'Effect of vitamin A supplementation on diarrhoea and acute lower-respiratory-tract infections in young children in Brazil' in: The Lancet 344 (1994) 228-231;
How did these deficiencies arise in the occupied Netherlands? Vitamin A can be absorbed in two ways. In the first place, vitamin A as such is present in many animal-source foods. When such foods are eaten, the body readily absorbs vitamin A. In the second place, the body can produce vitamin A from β-carotenes, which are present in considerable quantities in many plant-source foodstuffs. The researchers of the Polscommissie, for example, were surprised to find low vitamin A in combination with high levels of carotenes. More recently, however, the rate at which they can be turned into vitamin A by the body has been found to be much lower than had previously been estimated. Contrary to what was previously believed, sufficient vitamin A absorption cannot be easily achieved by consuming vegetables and other sources of carotenes. Rather, the estimated bio-efficacy of β-carotene when consumed exclusively from such sources ranges from 1:12 to as low as 1:40.\textsuperscript{420} The absorption of sufficient vitamin A in the absence of artificially fortified foods is to a large extent dependent on access to and consumption of a sufficient quantity of animal-source foods.

Vitamin A deficiencies in children can have several causes. First and foremost, many children eat a diet that is deficient in vitamin A. In many cases, it is the diet of the lactating mother that determines the absorption by her child. The problems of a diet that is deficient in vitamin A, as are common today in developing countries, are aggravated during lactation, when the required intake of vitamin A shoots up. Women in developing countries have been shown to transfer as little as half as much vitamin A to their children compared to the amount that women in developed countries transfer.\textsuperscript{421} In the case at hand, the causes of the vitamin A deficiencies are easily identified: the animal-source component of diets was too small and fortified margarine, which had been consumed before the war, had become all but unavailable. It is quite likely, but impossible to establish, that other micronutrients


420. C. E. West et al., 'Consequences of Revised Estimates of Carotenoid Bioefficacy for Dietary Control of Vitamin A Deficiency in Developing Countries' in: Journal of Nutrition 123 (2002) 2920S-2926S.

that play a role in maintaining a high level of immunity (such as zinc and selenium) were also lacking. These, like vitamin A, are best absorbed from animal-source foods.\textsuperscript{422}

**Conclusions and remaining questions**

The divergence between the mortality regime in Denmark and that in the Netherlands was caused primarily by the fact that a different diet prevailed in each of these two countries. Not only have alternative explanations failed to explain the difference between these countries, but the application of modern insights into micronutrients to the Dutch case has revealed that the Dutch diet, while saving the population from starvation, did not adequately cater to the qualitative needs of especially the young. Thousands of deaths between 1940 and 1944 can safely be ascribed to this ‘hidden hunger’. That said, two questions remain, and both require further investigation. The first concerns the regional patterns of nutrition and disease, the second our understanding of European wartime mortality. Neither of these issues can be resolved without extensive further investigations, but it is nevertheless useful to briefly assess the challenges that remain.

As noted in Chapter 3, there was a remarkable regional difference in the postwar effects of the famine winter on infant mortality. The area affected by famine – that is, roughly the western part of the Netherlands – quite unsurprisingly showed an increase in infant mortality during the months after liberation, clearly a consequence of prenatal exposure to malnutrition. Interestingly, a similar effect was found to have existed in the north and the east of the Netherlands, but not in the south during the same period. This is a highly relevant finding, because the south of the country, after liberation in 1944, had apparently not been plagued by the circumstances that caused prenatal damage in the north, east and west of the country. It is quite conceivable that the food situation in the liberated south improved considerably, at least as far as animal-source foodstuffs were concerned. The economic and social

history of this area in that chaotic period, however, remains a great unknown. Local history may be able to shed light on this issue in the future.

At the time of writing, such a local study is being undertaken at the opposite end of the country, namely in the city of Groningen. The fact that the north-east escaped famine during the Hunger winter has led to the widespread belief that the food situation there was unproblematic. This has been proven incorrect. It has been established through an investigation of birth weights and placenta weights that young mothers in Groningen, and especially mothers from the relatively poor parts of the city, were indeed seriously undernourished, albeit not in a quantitative sense. The local lore, according to which many people in the city lived on a diet of potatoes and very little else, seems to hold water in the light of medical-historical investigation.\textsuperscript{423} The division of the Netherlands into ‘the west’ and ‘the rest’ in terms of nutrition appears to be a back-projection of the Hunger winter onto the preceding war years.

As also noted in Chapter 3, the health problems experienced in the occupied Netherlands appear to have been similarly present in a large number of other countries as well, and during both world wars. It is interesting, first of all, to revisit the remarks made by Isabella Leith in 1950. She believed that the effect of the First World War on TB, which had been so much more marked in Germany and Britain, had everything to do with the different food supply. Indeed, while the effect of the First World War on civilian living standards in these two countries had been far less marked than during the Second World War, the increase in TB incidence was far greater. Research into the food provisions during the First World War are still in their infancy, but it is perfectly clear that arrangements at the time were dismal in comparison with those during the Second World War. More important, perhaps, is the fact that British child health during the Second World War was exceptionally good, a fact Leitch linked to the very effective programme to provide free school milk to all British children. This investigation of Denmark and the Netherlands certainly reinforces that view.

German children, as we have seen, were not so lucky. The decline in child health between 1933 and 1937, as described by Baten and Wagner, is seemingly paradoxical. The achievement of full employment, even if wages were kept down, 

\textsuperscript{423} Tassenaar, forthcoming.
must have been an improvement over the mass unemployment of the late Weimar Republic. True, medical and other public services suffered as a result of the government focus on rearmament, but that cannot explain the stunted growth found by Baten and Wagner. They rightly indicate food as the explanation, because the German diet was significantly reduced at the time. Still, in the light of the above, it seems questionable whether the medical problems were caused by a quantitative shortage of food (or, rather, of protein), as they claim. Instead, given the strong relation between the immune system and such micronutrients as vitamin A, one would suspect that it was the change to a more plant-centred diet rather than a quantitative shortage of food that affected German children so negatively.

Europe experienced two great wars during the twentieth century, and both caused the death of millions. The demographic consequences of these wars were enormous, and they still have a major impact on many of the societies that were affected. One of the major constituents of the death toll — namely indirect civilian casualties — remains under investigation today. A more extensive investigation, along the lines of what has been done here with Denmark and the Netherlands, into several countries or regions and spanning the period 1914-45, could shed considerable light on this issue — an issue, it should be noted, that has considerable relevance today: as long as warfare remains a common state of affairs in many parts of the world, indirect civilian mortality is here to stay.