ELSEVIER

Economics and Human Biology 1 (2002) 1–28

ECONOMICS
AND
HUMAN BIOLOGY

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Autarchy, market disintegration, and health: the mortality and nutritional crisis in Nazi Germany, 1933–1937

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Abstract

Trends in mortality, nutritional status and food supply are compared to other living standard indicators for the Weimar Republic (1919–1933) and for the early years of the Nazi regime (1933–1937). The results imply that Germany experienced a substantial increase in mortality rates in most age groups in the mid-1930s, even relative to those of 1932, the worst year of the Great Depression. Moreover, children's heights—an indicator of the quality of nutrition and health—were generally stagnating between 1933 and 1938, but had increased significantly during the 1920s. Persecution, by itself, does not explain such an adverse development in biological welfare; the non-persecuted segments of the German population were affected as well. The reason for this adverse development was caused by the fact that military expenditures increased at the expense of public health measures. In addition, food imports were curtailed, and prices of many agricultural products were controlled. There is ample evidence that this set of economic policies had an adverse effect on the health and nutritional status of the population. The highly developed areas of Germany with large urban sectors and the coastal regions of the Northwest were affected most from the policy of restricting imports of protein-rich agricultural products.

JEL classification: D6; F0; I1; N4; P4

Keywords: Autarchy; Market disintegration; Health

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1570-677X/02/$ – see front matter
PII: S1570-677X(02)00002-3

1. Introduction

This study analyses the development of the biological standard of living in Germany under the National Socialist regime before the outbreak of the World War II. The concept of the "biological standard of living" refers to those aspects of a broadly defined living standard that relate to human biology, such as mortality, morbidity, and quality of nutrition as measured by the physical growth of the human organism. These indicators have some advantages over the use of GDP per capita as a measure of well-being.[2] Although real GDP per capita increased rapidly in Nazi Germany, most scholars now agree that it has, in fact, little to say about the actual welfare of the population, inasmuch as most of the additional income generated helped finance state expenditures, including its substantial rearmament programs. In addition, the price and wage controls that were put into effect also invalidate, or at least call into question, most price indices.[3] Under such circumstances, the biological standard of living is of particular interest, for the response mechanisms of the human organism do not change when a political and economic regime switches from democracy, with a market economy, to totalitarianism and active state intervention. A rise in mortality implies unequivocally that important aspects of the living standard were deteriorating. Longevity, health, and the quality of nutrition are essential components of the utility function. When those components deviate from the standard GDP per capita measure, a more detailed study of human welfare is likely to yield noteworthy results.

The following section surveys indicators of nutrition, mortality, and morbidity in Nazi Germany. Section 2 examines those causes for the development of these three variables that are not based on the nutrition–mortality relationship, including public health. Section 3 presents evidence that protein deficiency could have played a role in mortality even if nutritional circumstances were relatively favourable. Section 5 considers the effects of autarchy and food-pricing regulation policies on regional nutritional status and mortality, and Section 6 concludes.

Our study is confined to the "early years of the Nazi regime" between 1933 and 1937, that is, before the incorporation of Austria and prior to the atrocities of the so-called Kristallnacht in 1938. The inclusion of the subsequent period would obscure the issue of the impact of persecution and war on living standards. For, even though persecution was intense prior to 1938, its demographic impact was insufficient to account for the increase in mortality reported below.[4]

[2] One could also argue that the disaggregated perspective on morbidity, mortality, and nutritional quality has advantages over the Human Development Index (HDI). In the theoretical framework of the HDI the biological aspects of well being are captured by life expectancy alone. However, for a discussion of short-run developments within one country a more disaggregated measurement procedure can yield important insights. For example, age-specific mortality provides additional information on the underlying economic processes causing the trends. Of the other two HDI components the literacy variable remains nearly the same within our short time frame in such an industrial country as Germany under investigation. But the index of higher education clearly shows a decline. Moreover, the HDI concept can be modified to yield more accurate possibilities of measuring living standards (Wagner, in press).

[3] We do not even know how German armament prices compared with world prices.

[4] The pre-1938 period presents another advantage in that Austria was often included in the German data after 1938, making comparisons with the prior period difficult.

Table 1
Death rates in Germany and Europe (per 10,000 inhabitants), 1928–1938

Years	Germany	England and Wales	The Netherlands	Denmark	Index	
					Europe	Germany
1928	116	117	96	110	100	100
1929	126	134	107	112	105	109
1930	110	114	91	108	95	95
1931	112	123	96	114	99	97
1932	108	120	90	110	98	93
1933	112	123	88	106	93	97
1934	109	118	84	104	91	94
1935	118	117	87	111	93	102
1936	118	121	87	110	92	102
1937	117	124	88	108	92	101
1938	117	116	85	103	89	101

Note: The European death rate is the unweighted average of the death rates of 20 European countries: Austria, Belgium, Bulgaria, Czechoslovakia, Denmark, Finland, France, Greece, Hungary, Ireland, Italy, The Netherlands, Norway, Portugal, Romania, Sweden, Switzerland, England and Wales, Scotland, Yugoslavia. Source: Mitchell, 1992, pp. 114–120.

2. The development of the biological standard of living

2.1. Mortality and morbidity

The crude death rate in Germany declined until 1932, as in Europe generally (Table 1).[5] However, 1932 marked a turning point: German death rates started to increase, whereas the European average continued to decrease.[6] The age-specific death rates increased, after having declined markedly in the 1920s, in all age groups except those of infants and of young adults aged 15–30 years (Table 2 and Fig. 1). Children (age 5–15) suffered the most. In stark contrast, age-specific mortality declined markedly in England in the 1930s in almost all age categories (Table 3).

Were the German developments merely an effect of a levelling-off after the rapid recovery following World War I? Germany achieved lower mortality rates than England in many age groups during the 1920s, but this lead was lost in the 1930s. By 1935, the death rate of children between 10 and 15 years in Germany exceeded those in England (Fig. 2). Except

[5] Crude death rates can be biased by the age distribution, especially in the long run. However, for short-run comparisons (half a decade or less), they provide useful evidence, insofar as the age distributions changes only slowly. It is impossible at this stage of research to calculate life expectancies for all the cross-sectional units used below in our regressions. However, we control for age shifts with the share of old people.

[6] This was even the case relative to such neighbouring countries as The Netherlands and Denmark, with initially low-mortality regimes. German death rates increased between 1932 and 1937, whereas those of The Netherlands and Denmark both fell slightly during that period (Table 1). It should be mentioned, though, that there was no significant reduction in crude death rates in England and Wales either, contrary to the general European improvement in the 1930s. It seems as if both major food-importing economies experienced problems in that period of market disintegration, but the present study shows that the German case was much more severe than the British one.

Table 2
Age-specific mortality rates in Germany, 1932 and 1937

Age groups	1932 (death rate per 1000 inhabitants)	1937 (death rate per 1000 inhabitants)	Percentage change 1932–1937[a]
0–1[b]	79.18	64.36	−18.7
1–5	4.50	4.65	3.3
5–15	1.40	1.59	13.6
15–30	2.66	2.61	−1.9
30–45	3.98	4.02	1.0
45–60	10.39	10.54	1.4
60+	53.63	55.25	3.0

Note: See Fig. 1. Both males and females. Source: Statistik des Deutschen Reichs, vols. 495, 517, Statistische Beilage Nr. 22 vom 28. Mai 1941 des Reichsgesundheitsblattes, p. 49.

[a] Differences in age-specific death rates between 1937 and 1932 in percentages of the death rates in 1932.

[b] Deaths per 1000 live births.

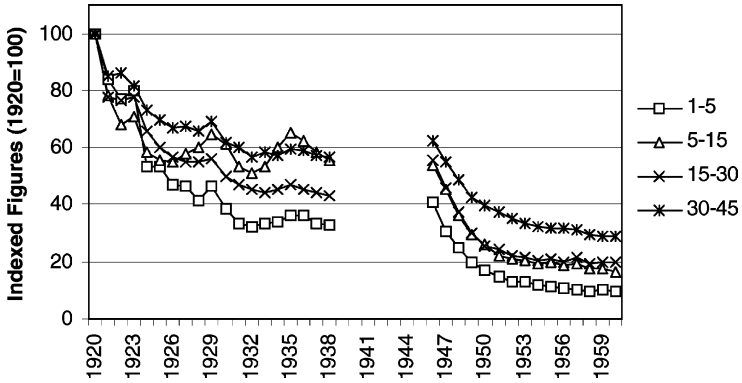

Fig. 1. Index of selected age-specific death rates in Germany, 1920–1960 (1920 = 100). Note: The borders of Germany changed over the period in question. The data are for the following territories: 1920–1938, German Empire (1925–1934, without Saarland); 1937, old territory of the Reich; 1946–1960, Federal Republic of Germany (1946–1957, without Saarland and Berlin-West; 1958–1960, without Berlin-West). Source: Statistik des Deutschen Reichs, vols. 307, 316, 360, 393, 423, 441, 495, 517.3, 587.2; Statistisches Jahrbuch für das Deutsche Reich 1938; Statistische Sonderbeilage Nr. 30 vom 26. Juli 1939 des Reichsgesundheitsblattes, Nr. 47 vom 20. November 1940 des Reichsgesundheitsblattes, Nr. 22 vom 28. Mai 1941 des Reichsgesundheitsblattes, Nr. 33 vom 19. August 1942 des Reichsgesundheitsblattes; Statistik der Bundesrepublik Deutschland, vol. 62; Statistisches Jahrbuch der Bundesrepublik Deutschland 1952–1962.

in the mid-1930s, trends in this age category were fairly similar in both countries. Between 1932 and 1937 the German population lost 0.4 years of its life expectancy at age 1, while the French gained not less than 1.3 years, the Swedish gained 0.4 years, and the US 0.5 years.[7]

[7] Calculated from Wagner (in press), http://demog.berkeley.edu/wilmoth/mortality. The Dasgupta/Weale Improvement Index (that adjust for convergence possibilities) is defined as follows: $((LE_{1937} - LE_{1932}) \times 100)/(80 - LE_{1932})$ (Dasgupta and Weale, 1992, p. 127). It shows the same pattern: Germany lost 2.6 index points, while France gained 7.4, Sweden 3.0 and the US 3.0 during this period.

Table 3
Age-specific mortality rates, England and Wales, 1932 and 1937

Age groups	1932 (death rate per 1000 inhabitants)	1937 (death rate per 1000 inhabitants)	Percentage change 1932–1937[a]
0–4	18.9	16.7	−11.90
5–9	2.1	1.9	−7.32
10–14	1.4	1.2	−17.86
15–19	2.4	2.0	−17.02
20–24	3.0	2.7	−11.67
25–34	3.2	2.9	−9.38
35–44	4.8	4.5	−6.25
45–54	9.4	9.1	−3.72
55–64	20.3	20.9	3.21
65–74	50.6	49.8	−1.48
75–84	124.7	123.4	−1.08
85+	271.4	277.1	2.12

Note: Unweighted average of male and female age-specific death rates. Source: Mitchell, 1988, p. 61.

[a] Differences in age-specific crude death rates between 1937 and 1932 in percentages of the death rates in 1932.

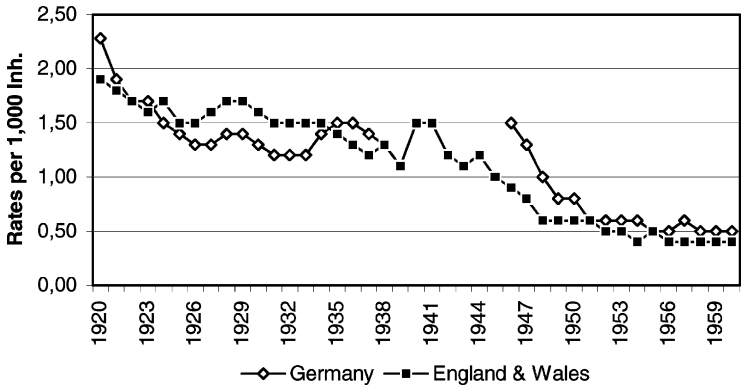

Fig. 2. Age-specific death rates (per 1000 inhabitants) of boys aged 10–15, Germany and England and Wales, 1920–1960. Note: Germany, see Fig. 1; England and Wales, age-specific death rates for boys aged 9–14. Source: Fig. 1 and Mitchell, 1988, pp. 61–62.

Furthermore, high morbidity is observable in some contagious disease categories. For instance, morbidity from diphtheria—one of the most serious and widespread infectious diseases of children and youth during the interwar period increased markedly after the mid-1920s, doubled again between 1932 and 1937, and reached extremely high levels during the war only to decline rapidly thereafter (Fig. 3).

2.2. Anthropometric indicators of the quality of nutrition

Anthropometric indices have been used by economic historians and development economists to study nutritional status (on the Soviet Union see Wheatcroft, 1999, pp. 27–60;

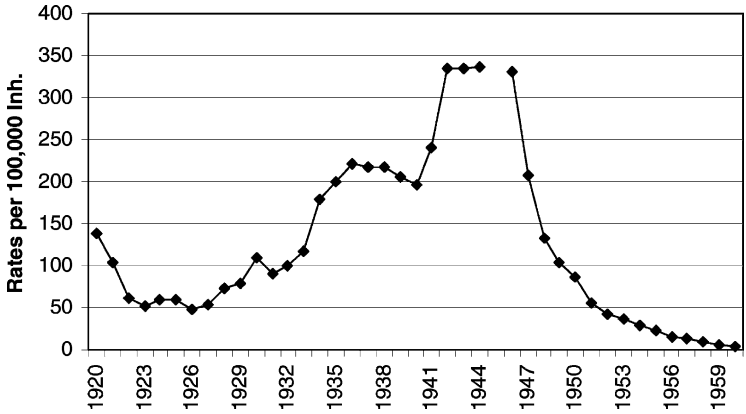

Fig. 3. Morbidity rates (per 100,000 inhabitants) from diphtheria, Germany, 1920–1960. Note: 1920–1938, German Empire (1925–1934, without Saarland); 1938–1944, territory as of 31 December 1937; 1946–1960, Federal Republic of Germany (1946, without Lindau, Saarland and Berlin-West; 1947, without Saarland and Berlin-West; 1948, without Saarland). Source: Statistisches Bundesamt, 1972, p. 119.

Komlos, 1999, pp. 71–79; Mironov, 1999, pp. 80–90. On China see Morgan, 1988, pp. 19–20. On the GDR, see Hermanussen, 1997, pp. 135–141. A summary is given in (Baten, 2002). Children's heights are particularly sensitive to environmental conditions, as indicated by the decline in height during the hunger years of World War I in the city of Stuttgart (Fig. 4) (Tanner, 1994, p. 3; Baten, 2000, pp. 20–22). The increases in physical stature were remarkably large during the 1920s among both boys and girls, but then slowed, and ceased or even reversed in the 1930s. The reversal of the positive secular trend in the only other German height series that survives in this period, for Leipzig, Saxony, was as dramatic as that

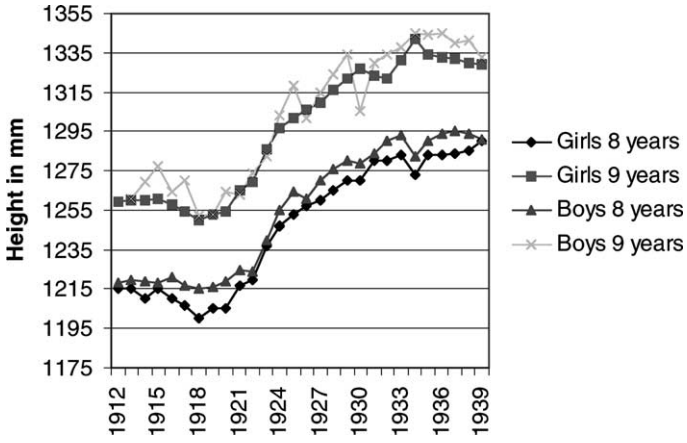

Fig. 4. Heights of children in Stuttgart. Source: Tanner, 1990.

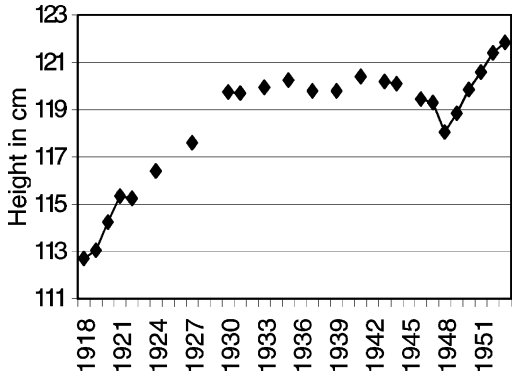

Fig. 5. Heights of children in Leipzig (6 years old). Source: Koch, 1953 cited after Marcusson (1962).

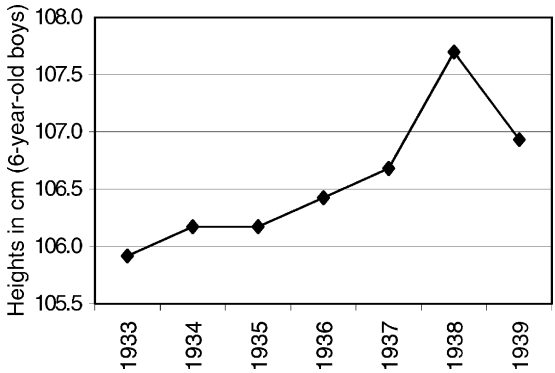

Fig. 6. Heights of children in Leeds. Source: Floud and Harris, 1997.

in Stuttgart (Fig. 5).[8] In marked contrast, heights of other European and American urban populations increased. Leeds, Glasgow, and eight other towns in Great Britain are just some examples (Fig. 6). Similar evidence exists for The Netherlands, and for Pittsburgh, US, during the Great Depression (Drukker and Tassenaar, 1997, pp. 331–377; Wu, 1992). The Soviet Union might be a counter example, insofar as heights did not increase much there during the 1920s and most of the 1930s. Only during the late 1930s was there a substantial

[8] Data on heights are astonishingly scarce for early-20th-century Germany. The military compiled height data but with long interruptions, and few records survive. Our nation-wide research among German archives indicates that measurements in prisons stopped around 1900, but that, while measurements in schools probably continued to be taken, the records are missing. There are, nevertheless, several published series of height measurements that are reliable, thanks to contemporary anthropologists who recorded them, among them Erich Koch of the University of Jena. In Leipzig the height series continuous up to 1953. The 1947 hunger is plainly visible, and the recovery after 1948 is striking, demonstrating that children's heights react very quickly both to adverse and to positive conditions. This makes the reasoning unlikely that the 1933–1938 crises may have been caused by a carry-over-effect from the Great Depression.

increase in height there (Baten, 2002).[9] Moreover, right after Mussolini had introduced a partial autarchy policy in the late 1920s. Italian heights increased much less than, say, Dutch heights (Baten, 2002).[10] In other words, heights were generally increasing vigorously in most countries during the 20th century, due primarily to improvements in food production and in health technology. The stagnation or decline of heights can, thus, be interpreted as an indication of nutritional problems.

In sum, stagnating heights of schoolchildren, interruption or reversal of the mortality decline, particularly of children, and high morbidity rates from diphtheria, all suggest that the biological standard of living in Germany was either declining, or was at most constant during the first years of Nazi rule. Relative to the achievements of other countries, it most certainly deteriorated. What could have been the factors behind such a development?

3. Explaining the crisis in the biological living standard

Economic growth can improve physical well-being because it enables people to purchase a more nutritious diet, better housing, and more medical services that are important to health. Because the relative deterioration of the biological living standard, accompanied by rising GDP per capita, was possibly due to a decline in disposable income for some segments of the society through rising inequality, the related developments are briefly outlined. We also consider the hypothesis, that a growing physical exertion from intensive work, specifically in the armament industry, had an adverse effect on workers' health[11] (Hachtmann, 1989, pp. 231–253; Geyer, 1989, pp. 392–397; Mason, 1977, pp. 157, 280–281, 314–315).

Persecution for racial and political reasons of important segments of the German society undoubtedly also had a negative impact on living standards in at least two ways: directly, through higher number of deaths from violence or suicides, and indirectly, through a deterioration in the delivery of medical services as Jews were forced to stop practising medicine and teaching in universities. With respect to the whole population, however, these effects may have played a greater role only after 1938.

Another set of determinants may be linked to malnutrition. Contemporaries emphasised the scarcity of food supply in the Third Reich even before World War II, especially the lack of animal proteins and fat, which was often discussed intensively hidden under the terminology "*Fettluecke*" (fat shortage) (Gumpert, 1940, pp. 77–80; Corni and Gies, 1997, pp. 309–314). The effects of two related policies of the Third Reich, instituted well before the start of the war, are examined here—those of the autarchy policy and of the newly created price-control system which brought about a disintegration of the food markets.

Income and income inequality: The economic recovery in the Third Reich is well documented (Fig. 7). Real GDP grew by some 55% between 1933 and 1937, and was impressive, for example, relative to The Netherlands, even if the recovery was not ahead of that of Great

[9] Heights of adults that were organised by birth cohorts.

[10] The question whether economic change can cause mortality increase in industrial nations was answered positively in the debate about the mortality increase in the Soviet Union of the 1980s and 1990s, and the mortality increase among East German older men in the 1990s. Note however, that completely different models apply to those situations in which the mortality increase was caused by a transition to a different economic system (see Dinkel, 1985 and Riphahn, 1999).

[11] For a differing opinion see Werner (1983, pp. 21–26).

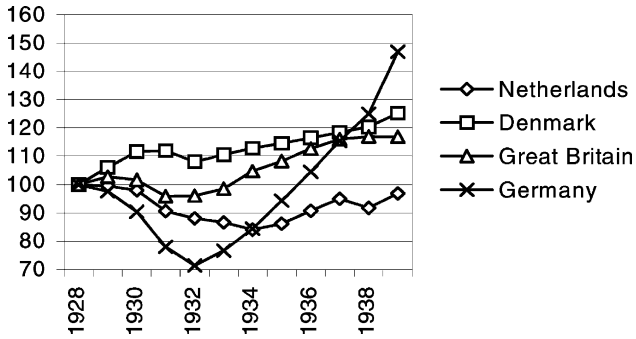

Fig. 7. Index of per capita GDP Germany, Great Britain, The Netherlands and Denmark, 1928–1939, (1928 = 100). Note: Germany, 1928–1934 without Saarland; 1938–1939 including the new territories. Source: Maddison, 1995, pp. 180–183; Ritschl, 2002.

Britain and Denmark. However, much of the additional output was spent on military equipment, and as a consequence, real aggregate private consumption increased by only 19% during that period (Ritschl, 2002). Moreover, the lower classes probably did not benefit from the economic recovery, insofar as personal income inequality widened during the Third Reich (Dumke, 1991, p. 128). Labour's share of the total national income decreased, even if compared with 1929, the last pre-crisis year (although during crises wage shares generally increase), in spite of a simultaneously substantial reduction of unemployment (Petzina, 1977, pp. 121–122).

The trend in real wages is controversial, primarily because price indexes are difficult to interpret. In addition, deterioration in product quality and the loss in utility due to non-availability of some goods pose conceptual problems of measurement. Real gross wages tended to rise, according to official statistics, in spite of government policy that fixed some wages (*Tarifloehne*), and by 1938, industrial wages recovered to their 1929 level (one of the outstanding boom years under the Weimar regime) (Petzina, 1977; Petzina et al., 1978, p. 98; Siegel, 1982, p. 104). However, reasonable adjustments to the official figures lead to a more sceptical view of the trends in real income,[12] and in all likelihood, German real weekly

[12] Hachtmann (1988) suggested that the official cost of living index not be used. He argues that it understates real price increases, because of shortages and/or quality deterioration in certain consumer goods, hidden inflation, housing shortages, and so on. Recent research by André Steiner and Christoph Buchheim confirms this view. Hachtmann considers a figure that was mentioned in an unofficial document to be more reliable. In addition, he calculated the allowance for increased compulsory or quasi-compulsory levies. On the other hand, even if we would allow the cumulative inflation in food prices to be two–three times higher than the official index indicates, we would still not obtain stagnating wage levels. As a first check, note that wholesale prices of foodstuffs increased by 24% from 1933 to 1938, while the CPI reports only a 7% cumulative increase in the same category. Arguably, wholesale prices (WPI) were politically less visible and their statistics less likely to be rigged than the CPI series. Using the WPI deflator for foodstuffs to deflate wages would thus decrease real wages by two-thirds. The compulsory deductions included contributions to social insurance institutions and direct taxes such as income and citizen taxes. Voluntary contributions embraced regular contributions to the Party, the Labour Front, the "People's Welfare," and other public or semi-public organisations (Oppenheimer-Bluhm, 1965, pp. 20, 23; Siegel, 1982, p. 105; Hachtmann, 1988, pp. 34–47).

net wages in industry did not recover before the war to their 1929 level (Hachtmann, 1989, pp. 158–159; Overy, 1994, pp. 263–264). In addition, females were actively deterred from participating in the labour force. Given that averages wages probably stagnated, and that the distribution of income probably became more skewed, it is quite possible that the real income of the lower classes declined, which could have contributed to the increase in mortality. On the other hand, the overall increase in total employment certainly alleviated some of labour's losses, particularly if the situation is compared with the conditions during the economic crisis of 1930–1933.[13] The average family had more members participating in the labour force, and fewer needed welfare assistance. The real total household incomes were probably higher in 1937–1938 than at the outset of Depression (before the Nazi take-over), even if real wages of individuals did not recover unambiguously (Oppenheimer-Bluhm, 1965, pp. 69–70; Kranig, 1992, p. 144; Werner, 1983, p. 19). Thus, the conclusion emerges that private incomes certainly did not increase as much as GDP growth rates suggest, but at the same time there is no compelling evidence that income of the lower classes declined to such an extent as to account for a deterioration in the biological standard of living.

Growing physical exertion from more intensive work: Increases in weekly wages were generated by longer working hours, not by an increase in the hourly wage rate. By 1938, the weekly workload increased by some 3.6 h (compared with 1933), while the trend during the Weimar Republic had been in the opposite direction (Bry, 1960, p. 48). The increase in working hours was accompanied by greater physical exertion from more intensive work with a combined negative impact on workers' health. The incidence of industrial accidents also increased by 4% between 1929 and 1937 (calculated from Hachtmann, 1989, p. 248, Table 24). In addition, there was an increase of 15% from 1933 to 1937 in the rate of sickness among health-insured persons, even if sickness rates did not return to the levels of the late 1920s (Hachtmann, 1989, p. 232, Table 21). These developments are not surprising, because fluctuations of both morbidity rates (gathered from health insurance companies) and accident rates are generally correlated positively with the movement of the business cycle.[14] On the other hand, there is considerable evidence that the National Socialist regime took several measures to prevent workers from calling in sick and forced them to return to work before they were fully recovered (Hachtmann, 1989, pp. 231–253; Knödler, 1991, pp. 121–122). As a result, the published morbidity rates may well understate the morbidity increase. Yet, even with morbidity rates failing to reflect the workers' true health status, the relative deterioration of the biological standard of living cannot be completely explained by worsening working conditions, because the age pattern of the mortality change between 1932 and 1937 does not fit that explanation. Mortality rates of children (ages 1–14) increased the most, and that segment of the population was not exposed to physical exertion in the workplace, and mortality of people between 15 and 60 years changed very little. Accordingly, other influences that affect peoples' health at younger ages should be considered.

[13] Even if not everyone would accept the decrease in unemployment between 1932 and 1935 at face value. Silverman (1988) expressed doubts about the Nazi statistics but did not estimate the degree of falsification (see also Buchheim, 1994).

[14] Lower unemployment tends to lead to a higher propensity to claim insurance payments, whereas higher unemployment often makes people go to work even if they are not feeling well. Moreover, more people in a poor health status are employed in a full-employment economy than during a period of high unemployment.

Medical services: Published statistics on health expenditures and the number of physicians are somewhat inconsistent.[15] Nevertheless, the spotty evidence implies that even though medical services (the numbers of hospital beds and physicians per 10,000 inhabitants) had expanded significantly in the second half of the 1920s, they did not improve markedly in the early Nazi years (Table 4). The number of patients grew twice as fast as the number of available beds (Kater, 1989, p. 43).[16] The medical profession lobbied with limited success for an extension of the hospital sector in the later 1930s (Kater, 1989, p. 43).

Although the ratio of 7 doctors per 10,000 inhabitants was quite good by international standards (Süß, 1998b, p. 204), it was below the peak Weimar level. Immediately after the Nazi take-over, the process of outlawing Jewish doctors began and escalated thereafter (Kater, 1989, pp. 177–221; Kümmel, 1993, pp. 70–74). By the fall of 1938 all Jewish physicians' licences to practice were revoked, affecting about 8000–9000 doctors—16% of all physicians (Kater, 1989, p. 221; Kümmel, 1993, p. 74).[17] Furthermore, the quality of medicine as a professional discipline declined through the exclusion of both Jewish medical students and scholars.[18] Health expenditures of the state and of health insurance companies also developed unfavourably in Germany between 1932 and 1938 (Table 5). Real payments for medical treatments by social insurance (*Krankenkassen*) recovered after the Depression, but not fully to their 1929 level (Süß, 1998a).[19] Moreover, the number of people receiving voluntary health services, such as recuperation measures and sickness prevention decreased by 70% between 1930 and 1937 (Tennstedt, 1976).[20]

Public health measures: Public health services expanded during the 1920s, but were substantially cut back during the economic crisis until 1934 (Table 5) (Sachße and Tennstedt, 1992, p. 166). Due to the creation of a state-centralised system of public health departments, those expenses more than tripled in the following 2 years to 57 million Reichsmark (Süß, 1998b, p. 48), but they accounted for only an inconsequential share of total health

[15] For example, the number of physicians published in Statistische Jahrbücher differs from those compiled by the medical bureaucracy (Kater, 1989, p. 267). Similarly, the health companies' expenditures on medical treatments are slightly inconsistent. They vary among publications, because the types of health insurance companies included varied.

[16] For the number of hospital beds and their number of patients see also Sachße and Tennstedt (1992), p. 176, Table 2.18.

[17] Despite that considerable loss, a substantial supply shortage was not openly discussed before the beginning of the war. However, it should be borne in mind that the consequence of outlawing Jewish or politically suspect doctors from the profession may have been more severe at the local level. The number of Frankfurt's local health insurance doctors (AOK Frankfurt) decreased from 455 to fewer than 350 between 1932 and 1938 (Hitzler, 1952, p. 19). In addition, the deterioration of the general health situation may have increased demand and caused a marked decline in the doctor–patient ratio (Kater, 1989, p. 41).

[18] Changes in the medical curriculum also had an adverse impact on the training of doctors. Traditional medical subjects were abridged to make room for such fields as race hygienics (e.g. Kater, 1989, pp. 46,172, 46,174; Van der Bussche, 1993, pp. 117–128).

[19] On a local level, the nominal expenditure for medical treatments per member of the Frankfurt's local health insurance company (AOK Frankfurt) increased after the Depression, but it did not recover to the levels of the late 1920s (Hitzler, 1952, p. 19).

[20] The numbers were: 1930, 89,613; 1931, 43,367; 1932, 8584; 1933, 7186; 1934, 12,087; 1935, 24,374; 1936, 27,014; 1937, 27,000. The slight recovery in these numbers after 1934 was due to the Law for the Prevention of Hereditarily Diseased Offspring from 14 July 1933 because costs for these measures were recorded under the title "illness prevention and recovery measures".

Table 4
Medical provision in Germany, 1924–1939

	Hospital beds	Medical doctors
Rates per 10,000 inhabitants		
1924	75.2	6.4
1925	77.5	
1926	79.6	
1927	82.2	6.9
1928	85.7	7.1
1929	88.6	7.5
1930	90.9	7.4
1931	91.0	7.4
1932	90.4	
1933	90.7	
1934	91.0	7.3
1935	92.0	7.2
1936	92.2	7.2
1937	92.7	7.3
1938[a]	92.9	7.3
1939[a]	87.1	7.0
Indexed figures 1924 = 100		
1924	100	100
1925	103	
1926	106	
1927	109	108
1928	114	111
1929	118	117
1930	121	116
1931	121	116
1932	120	
1933	121	
1934	121	114
1935	122	113
1936	123	113
1937	123	114
1938[a]	124	114
1939[a]	116	109

Source: Statistisches Bundesamt, 1972, pp. 124–125.
[a] Territory of the year of 1937.

expenditures and for only 0.4% of the military expenditure in 1937. Therefore, an extremely small part of the additional aggregate income was used for investments in the public health sector. Altogether it appears that medical services did not deteriorate dramatically between 1933 and 1937, even if it is possible to identify some adverse developments. Nonetheless, it seems unlikely that the rise in mortality, particularly that of children, was caused by changes in the delivery of medical services to the population.

The Nazi population policy focused on the prevention of infant mortality, mainly through a wider public education of child care and the promotion of breastfeeding and healthy nutrition (Seidlmayer, 1937; Naumann, 1941; Pine, 1997, pp. 23–38). Totalitarian regimes are

Table 5
Health and armament expenditures, Germany, 1928–1938 (million Reichsmarks, constant prices of 1928)

Year	Public health expenditures	Expenditures of health companies for medical treatments (including drugs)	Armament expenditures (without expenditure on transport and construction measures)
1928		670	700
1929		728	
1930		727	
1931		664	
1932	21	580	912
1933	18		2372
1934	17	599	3800
1935	47	673	6800
1936	57	695	12844
1937	50	718	13657
1938	52	766	21390

Source: Estimated from Süß (1998b), pp. 539–541; Overy (1994), p. 48.

relatively efficient at reducing infant mortality, considering that the first 12 months are mainly influenced by parental behaviour and—compared with the mortality of older children—not linked as much to the availability of nutritional resources. Moreover, behaviour can be influenced by propaganda, at which totalitarian regimes are often particularly skilled (Baten, 2002).[21] The number of maternity, child, and infant welfare centres increased from 6617 in 1928 to 14,876 in 1937. Almost 70% of all live births were monitored by those institutions in 1937 (Sachße and Tennstedt, 1992, pp. 166–168). Infant mortality decreased markedly by 18.7% between 1932 and 1937 (Tables 2 and 6).[22] Yet, in spite of those considerable efforts to improve infant survival, it did not do so any faster than in most other European countries during the same period of time (Mitchell, 1992, pp. 119–120). Contemporaries speculated in that the increase in fertility in the first years of Nazi rule could have led to higher infant and maternal mortality. Thus, the impact of fertility increase on mortality is also included in our regression analysis below.

Much effort during the Nazi years was also directed towards older children, but it seems to have had only limited success.[23] Public health policy failed in the fight against diphtheria, the most important single cause of death among children between the age of 1 and 15.

[21] But totalitarian regimes are also good at short-circuiting public lobbying for social benefits—which often leads to suboptimal outcomes.

[22] This does not include deaths caused by congenital malformations. Infant mortality from congenital malformations may have increased because those infants were neglected or killed. However, it could also be that more diseases were recorded under that category. This pattern of change in causes of death reflects the ambiguous character of Nazi population policy: while it tried to "eliminate" those who were taken as "racially and hereditarily inferior," it supported those who were seen as both "hereditarily healthy and productive" members of the society.

[23] Most efforts were directed towards schoolchildren through health supervision including medical, dental, and orthopaedic inspection, physical education, control of infectious diseases in schools, sanitation of school premises, supervision as well as recuperation measures of sick children, education about genetics and racial hygiene (Hecker, 1954, pp. 110–117; Sachße and Tennstedt, 1992, pp. 168–169).

Table 6
Main causes of death under age one, Germany, 1932 and 1937 (deaths per 1000 live births)

Causes of death	1932	1937	Percentage of change 1932–1937[a]
Diseases of the newborn	36.7	28.8	−21.6
Congenital malformations	2.6	3.6	38.2
Infectious and parasitic diseases	5.6	5.0	−9.9
Diseases of the respiratory system	11.8	10.5	−11.4
Diseases of the nervous system and sense organs	8.9	4.4	−50.6
Diseases of the digestive system	8.9	8.0	−10.1
Deaths from violence	0.7	0.6	−4.9
Unknown causes of death	1.4	1.2	−14.0
Other named causes of death	2.0	2.0	−1.4

[a] Differences in cause-specific crude death rates between 1937 and 1932 in percentages of the death rates in 1932. Source: Table 7.

More children died from diphtheria (16%) than from tuberculosis (10%), pneumonia (14%), or accidents (11%) (calculated from sources of Table 7). As mentioned above, morbidity rates from diphtheria increased after 1925 in Germany, as in many other countries. However, German health authorities introduced vaccination programmes slowly by international standards (Süß, 1998b, pp. 241–250). Similarly, Lewis (1986) established that Britain failed to prevent diphtheria efficiently through the introduction of a national immunisation campaign in the 1930s. Until 1939–1940 German health authorities still favoured older forms of state intervention, relying on isolation and disinfection. After 1939, immunisation programmes were conducted at the local level, and only in the fall of 1941 did the Reich Ministry of the Interior finally recommend that communities experiencing diphtheria epidemics carry out vaccination programmes. In contrast, countries such as the US had introduced immunisation programmes already in the 1930s with a new diphtheria toxoid that was available in Germany by 1936.[24] However, it took another few years for the vaccine to be administered on a broad scale. As a result, German diphtheria death rates increased from 6.1 in 1932 to 9.6 per 100,000 inhabitants in 1937, whereas they decreased from 4.4 to 2.0 in the US Table 8 and US Department of Commerce, 1975, p. 58).[25]

4. Did malnutrition play a role in the mortality trends?

Infectious diseases such as tuberculosis, respiratory infections (bacterial and viral), measles, whooping cough, bacterial diarrhoea, and some parasitic diseases are definitely influenced by the nutritional status (Lunn, 1991, p. 137). Diphtheria and influenza are at least partly affected by nutrition, and mortality from respiratory diseases (such as pneumonia and bronchitis) and diseases of the digestive system are most likely linked to nutritional

[24] Some American cities such as New York successfully conducted vaccination programmes against diphtheria before the 1930s (Hammonds, 1999).
[25] Contemporaries were aware of the higher German morbidity rates from diphtheria than in other countries (Gumpert, 1940, p. 56; Gundel, 1936, p. 14).

Table 7
Differences in cause-specific, age-standardised mortality (SMR) in Germany (differences of percentage points, per 10,000 inhabitants), 1925–1932, 1932–1935, 1932–1937[a]

Causes of death	1925–1932	1932–1935	1932–1937
Diseases of the newborn and malformations[b]	3.4	−1.1	−3.5
Childbirth[c]	0.3	−0.4	−1.0
Acute childhood infections[d]	−1.1	0.5	0.3
Influenza	−0.7	1.4	0.8
Tuberculosis (all forms)	−3.2	−0.2	−0.7
Other infectious diseases[e]	−0.8	0.2	0.1
Pneumonia	−2.2	1.1	0.4
Other respiratory diseases	−0.9	0.0	−0.3
Circulatory system	−3.0	1.3	1.5
Central nerve system and sense organs[f]	0.8	−1.0	−1.4
Digestive system	−2.1	−0.4	−0.4
Cancer and other tumours	1.3	0.2	0.2
Suicide	0.3	−0.2	−0.1
Accidents[g]	−0.4	0.6	1.0
Other causes[h]	−6.2	−0.3	−1.5
Ill-defined diseases	1.5	−0.3	−0.6

Source: Calculated from Statistische Sonderbeilage zur Nr. 25 vom 22. Juni 1927 des Reichsgesundheitsblattes; zur Nr. 11 vom 11. März 1936 des Reichsgesundheitsblattes; Nr. 30 vom 26. Juli 1939 des Reichsgesundheitsblattes; Nr. 22 vom 28. Mai 1941 des Reichsgesundheitsblattes.

[a] SMR: German population in 1925. Causes of death classification changed in 1932.

[b] Deaths per 1000 live births. 1925: Weakness of life and congenital malformations; 1932–1937: weakness of life, premature birth, congenital defects, other diseases of infants under 3 months and congenital malformations in the first year of life.

[c] 1925: Puerperal fever and other diseases of childbirth; 1932–1937: diseases of pregnancy, childbirth and puerperal state.

[d] 1925: Measles and rubella, whooping cough and croup, diphtheria and scarlet fever; 1932–1937: measles, whooping cough, diphtheria and scarlet fever.

[e] Infectious and parasitic diseases without acute childhood infections, influenza and tuberculosis.

[f] 1925: Stroke and other diseases of the nervous system; 1925–1937: including diseases of the sense organs.

[g] 1925: Accidents and other deaths from violence (without suicide and homicide).

[h] 1925: Old age, diseases of the genito-urinary system and other stated causes of death; 1932–1937: old age, diseases of the genito-urinary system, diseases of blood and blood-forming organs, chronic poisoning, rheumatism, diseases of nutrition and endocrine glands and other general diseases, diseases of the bones and organs of locomotion, diseases of skin and cellular tissue and other stated causes of death.

status. In contrast, mortality from diseases such as tetanus, malaria, smallpox, and yellow fever are independent of nutritional status, as are deaths due to non-communicable diseases, such as cancer, as well as from violence. Table 7 presents differences in percentage points in cause-specific, age-standardised mortality rates in Germany in three time periods: 1925–1932, 1932–1935, and 1935–1937.[26] Positive values indicate that cause-specific mortality increased. During the Weimar period (1925–1932) all causes of death that were

[26] Standardised mortality rates were calculated because diseases affect people differently depending on their age. The standardised death rates used represent the mortality of the inhabitants in the various years, assuming the structure of the population at risk was the same as that of the year 1925.

Table 8
Change in cause-specific mortality, England and Wales and Germany, 1932 and 1937 (percentage increase of death rates per 10,000 inhabitants)

Causes of deaths	England	Germany	Difference
Infectious and parasitic diseases	−8.5	8.4	17.1
Inclusively measles	−69.4	−15.8	53.6
Inclusively scarlet fever	−30.8	88.4	119.2
Inclusively whooping cough	−41.9	−0.3	41.6
Inclusively diphtheria	24.1	56.4	32.3
Inclusively influenza	38.8	65.5	26.7
Inclusively tuberculosis	−17.0	−7.8	9.2
Cancer and other tumours	7.2	11.0	3.8
Rheumatism, diseases of nutrition and endocrine glands and other general diseases	8.8	21.1	12.3
Diseases of the blood and blood-forming organs	−1.7	2.4	4.1
Diseases of the nervous system and sense organs	−3.3	1.2	4.5
Diseases of the circulatory system	20.6	23.6	3.0
Diseases of the respiratory system	−6.6	13.6	20.2
Inclusively bronchitis	−13.8	7.8	21.6
Inclusively pneumonia	−2.0	19.4	21.4
Diseases of the digestive system	−7.9	4.8	12.7
Deaths from violence	2.2	13.3	11.1

Note: Diseases that are at least variably nutrition-sensitive are given in italics. Column 2 and 3: differences in cause-specific crude death rates between 1937 and 1932 in percentages of the death rates in 1932. Column 4: differences between column 2 and 3. Source: Table 7 and the Registrar-General's (1940), pp. 25–38. We thank Bernard Harris for generously providing the English statistics.

certainly or possibly associated with the nutritional status declined. By contrast, mortality from most of those causes, such as acute childhood infections, influenza, and pneumonia, increased in the second half of the 1930s, compared to 1932. Only tuberculosis continued to decline in the 1930s, probably due to the implementation of mass X-ray screening, which helped identify tuberculosis at an early stage,[27] but that decline was slower than it had been from 1925 to 1932. The overall increase in infectious diseases in the 1930s is unexpected, inasmuch as the model of the epidemiological transition implies that during the 1930s mortality caused by degenerative diseases would increase, but mortality from communicable diseases would decline.[28] Table 8 presents the percentage differences in

[27] Earlier diagnoses improved the chances of cure (Blasius, 1996, pp. 330–331). The prompt identification of potential carriers of the tuberculosis bacillus became also progressively more necessary because of the new collective National Socialists mass organisations (Sachße and Tennstedt, 1992, p. 170). Thus mass screening was prevalent in the army. In Königsberg, all new recruits doing compulsory military service were X-rayed by the fall of 1935. The number of people X-rayed increased considerably under the Nazis (Proctor, 1999, pp. 87–88; Szerreiks, 1939, p. 74). By 1937, tuberculosis welfare centres administered 1.5 million X-rays in the Reich (Sachße and Tennstedt, 1992, p. 170).

[28] Applying the model of the epidemiological transition, Spree (1992) argued that the transitional phase (the age of declining epidemics) ended after the World War I and the so-called age of degenerative and man-made diseases started in Germany. Thus, the period under investigation belongs to phase three of the epidemiological transition and should be characterised by an increasing importance of cancer and diseases of the heart and circulatory system.

cause-specific death rates between 1932 and 1937 in Germany and England.[29] Column 4 illustrates the disparity of the mortality change between the two countries. The German development was less favourable in many nutrition-related diseases, such as acute childhood infections and influenza, as well as diseases of the respiratory system, including pneumonia and bronchitis. However, the gap between German and English mortality changes was less marked for such degenerative diseases as cancer or diseases of the circulatory system. Thus, between 1932 and 1937, Germany experienced greater increases in mortality from nutrition-related diseases than England, even though some nutrition-related mortality increased there as well.[30]

In sum, mortality from several infectious childhood diseases and from pneumonia rose in Germany of the 1930s, whereas those causes of death had been substantially reduced between 1925 and 1932. Because most of those diseases are related to protein deficiency at least to some extent, the inference is warranted that nutrition may well have played a role in the deteriorating mortality regime in Germany of the 1930s.

5. The impact of autarchy and price control on regional mortality

What could have influenced the quality of nutrition sufficiently to affect mortality rates, if real family incomes did not decline? One important aspect of nutrient quality is the amount of proteins available, as these are essential for the proper functioning of the immune system and all living cells, even if temporary decrease in protein intake does not have immediate deleterious consequences.[31] One should also consider the regional differences in consumption patterns particularly those caused by the Nazi autarchy policy.

Currency reserves were extremely limited during the Depression, and the high-tariff policies of many countries, but especially the overvaluation of the German Mark not only prevented Germany from increasing its exports but also greatly limited its imports.[32] However, the balance-of-payment argument is only partially valid, insofar as Germany did import raw

[29] The comparison of cause-specific crude death rates between Germany and England and Wales is somewhat distorted because of the differences of the population at risk between Germany and England and Wales. Yet, the age structure of the population of both countries was fairly similar in the early 1930s.Age structure of the population (in percentage of the total population), Germany (1933) and England and Wales (1931).

	Age groups						
	0–5	5–14	15–29	30–44	45–59	60–69	>70
Germany	7.8	16.0	26.9	22.3	16.6	6.9	3.8
England and Wales	7.5	16.3	25.7	21.3	17.5	7.3	4.2

Source: Derived from Statistisches Jahrbuch des Deutschen Reich, various issues; Mitchell, 1988, p. 15.

[30] In fact, protein consumption per capita (meat, milk, and eggs) was higher in England than in Germany in the mid-1930s (Von der Decken, 1937/1938, pp. 178–179).

[31] The desire for protein by the human organism is not overwhelmingly strong: one does not necessarily experience a feeling of starvation when proteins are missing from the diet.

[32] Not all currencies were convertible, as large share of Germany's trade were channelled into bilateral clearing arrangements; Germany's disappointing export performance also had to do with its default of 1933.

Table 9
Change in beef production 1929–1936 in Germany by regions (%)

	Interior	Coast
Rural	+0.8 Bavaria +2.9 Wuerttemberg +6.7 Saxonia	−36.8 Schleswig-H. −65.0 Mecklenburg
Urban	−1.4 Berlin	−21.4 Hamburg −42.4 Bremen −76.3 Luebeck

Note: Based on slaughtered animals. Source: Statistisches Jahrbuch, various issues.

materials for rearmament. The currency used to buy Swedish iron could have just as easily bought Danish cattle. In addition, the balance-of-payment was only one of the two reasons for the switch to an autarchy policy. The other one was motivated by military purposes. During World War I the German population had gone from hunger to revolution—and that dramatic experience had to be avoided at any cost. Thus, food imports did not cease in the

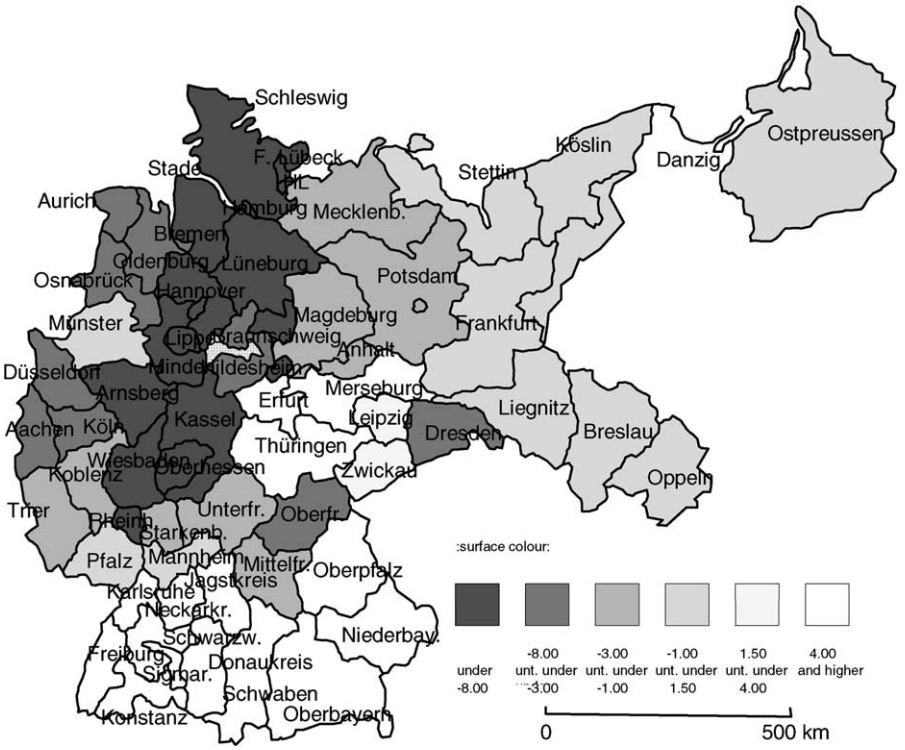

Fig. 8. Changes of purchasing power of beef between 1933 and 1936 (%). Source: Statistisches Jahrbuch für das Deutsche Reich, various issues.

1930s, but their protein content was less than in the 1920s. In the 1930s more grain was imported from Southeastern Europe, but food imports did not increase by as much as would have been feasible as well as expected, given the increase in GDP—balance-of-payments notwithstanding—because of the import substitution from food to raw materials for rearmament (Hoffmann et al., 1965, pp. 524–525).

The impact of the autarchy policy on the coastal areas was dramatic (Table 9). In Schleswig–Holstein and Mecklenburg, 37 and 65% fewer cattle were slaughtered in 1936 than in 1929, because of the limitation on imports of live cattle. The trends were similar in the port cities. In contrast, cattle slaughtering increased in the more agricultural regions of the South and Southeast, and remained constant in Berlin, indicating the regionally diverse impact of the autarchy policy. We are focusing on beef as a protein-intake indicator not only because of its nutritional value but because of the availability of data. We would have preferred to include pork and milk consumption, but the lack of extant statistics prevents us from doing so. The Nazis were eager to keep prices artificially low for milk and bread (and to some extent for pork), but they were much less concerned about beef, and consequently beef prices were set by market forces. Given the possibility of substituting among food products, the high beef prices also imply that other meat and dairy products were scarce. The controlled low prices led to decreasing supply, as many farmers who were previously concentrating on dairying, then switched to beef production, especially in the regions with high beef prices.

The amount of beef that an unskilled wage earner could buy did, indeed, decline sharply in the Northwest by some 8% (Fig. 8). The dairy region of Muensterland was affected less, and the regions along the Dutch border were also doing better. Nonetheless, the whole Northwest faced worse conditions than the South and Thuringia, and the East took an intermediate position. Danish cattle and Dutch meat were definitely in short supply in the Northwest.[33] If we compare this indicator of protein shortage with the regional differences in mortality increase, the parallel is striking (Fig. 9). Potsdam, the region around Berlin, and the Saxon area of Zwickau did somewhat worse than expected on the basis of our protein-shortage indicator.

The second source of regional inequality was the introduction of regulation of the price of food. The policy posed a dilemma for the Nazi government because many farmers had been strong supporters of the National Socialist movement from the very beginning, and as a result they expected high prices for their products (Corni and Gies, 1997, pp. 309–314). At the same time, the Nazis feared dissatisfaction from people living in industrial cities that could have threatened the smooth functioning of the armament industries. The solution was to regulate prices and to reduce the profits of the food merchants, which required an enormous bureaucratic effort. Anti-semitic motivations further reinforced that policy approach. The result was, of course, a less-efficient food distribution system. An artificial reduction of profits induced many firms to move out of the trade, hindering the interregional exchange of products.

As a consequence, the integration of food markets between rural and urban areas was breaking down, and farmers had an incentive to consume more foodstuffs within their

[33] Other regional differences stem from the possibilities to increase local protein production. For example, in Thuringia protein consumption was increased, whereas in Hesse, with its traditionally high protein production, there were no suitable factor inputs left to increase protein production. In Mecklenburg there was an increase in non-market consumption (meat and milk that was previously bought on markets, but subsequently were purchased directly from the farmers) that did keep the prices within bounds.

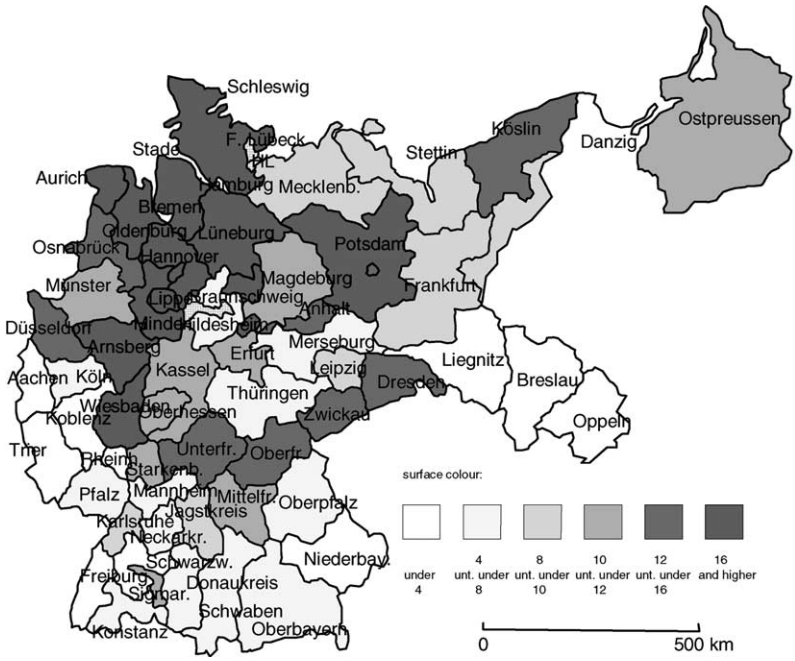

Fig. 9. Changes of mortality rates between 1932 and 1936 (%). Source: Statistisches Jahrbuch für das Deutsche Reich, various issues. We thank M. Haines for sharing his data with us.

own households. This was especially the case with perishables. Based on evidence from Munich and Dresden, the result was a diminution in urban meat consumption (Fig. 10), which is mirrored by the increase in mortality. According to Prussian data, larger cities, with 100,000 or more inhabitants, experienced a more significant increase in mortality, than

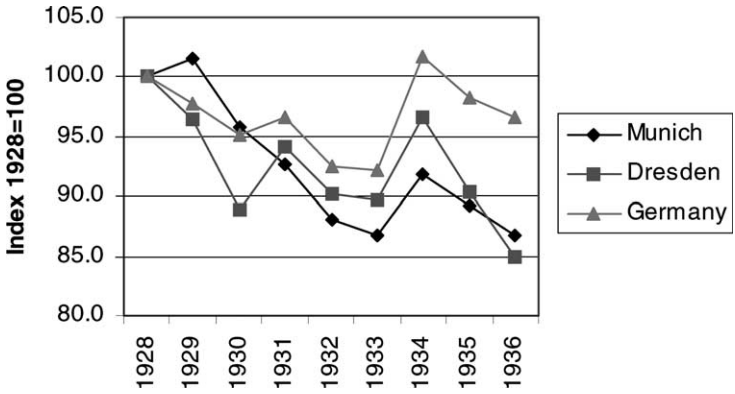

Fig. 10. Meat consumption in Germany and in two cities. Source: Vierteljahreshefte zur Statistik des Deutschen Reiches, 1938; Statistische Jahrbücher of various German cities.

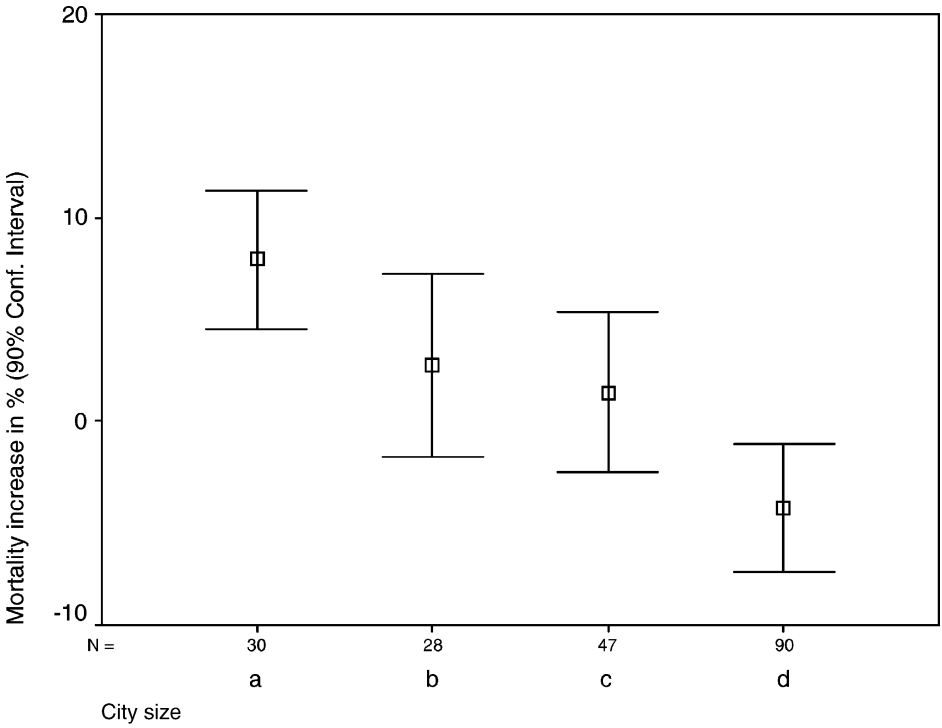

Fig. 11. Mortality increase in Prussian cities (adjusted increase, 1932–1938). City size: (a) 100,000 and more, (b) 50,000–100,000, (c) 30,000–50,000, (d) 15,000–30,000 inhabitants). Source: Statistische Sonderbeilage zur Nr. 11 vom 11. März 1936 des Reichsgesundheitsblattes; Nr. 4 vom 26. January 1941 des Reichsgesundheitsblattes.

smaller ones, and small towns (15,000–30,000 inhabitants) even had declining mortality experience (Fig. 11). It may well be that small towns had better access to food on account of their rural hinterland.

However, the decline in meat consumption was by no means large compared to the 1928 level. Several considerations question the validity of these official statistics. (1) We are unable to verify the accuracy of these politically sensitive data in a totalitarian state that claimed legitimacy through raising welfare (Von der Lippe, 1996). The numerous reports about empty shops certainly call into question their reliability.[34] In addition, a study by the

[34] Hinze (1993) reports on the year 1935 that beef, pork and fat is not available. Source: LB Stapo 6/1935 Auszug aus folgenden Archivalien GStA, Nr. 2,4, Bl. 29, p. 54, and "... the population receives generally in the cities of my county not enough pork, and not enough fat originating from cattle and pigs, because of insufficient supply. A strong under-supply of all necessary fats characterises human nutrition ... butter is not available, not even in the large cities ... RP 6.10.1935", there are fights in the streets and panic purchases take place: "... the butter and meat scarcity leads to and "excellent" spirit in the streets. Some women became violent against Nazi supporters, who tried to excuse the scarcity.... I was in various department stores , and saw how women were carried away, who had passed out after waiting for hours to buy 1/16 lb of utter or 1/4 lb of peanut butter... LB der KPD, 20.12.1935."

US Ministry of Agriculture concluded that meat consumption of German workers decreased by 17% between 1927 and 1937, milk consumption by 21%, and egg consumption by 46%. At the same time, the much debated fat shortage was only about a decline of fat consumption of "only" 7% (Franklin, 1940). (2) Even if the official figures were correct: unequal distribution of nutritional resources would still remain a problem. How much was locally consumed by farmers, who had a very favourable diet anyway? Hence, the national average is not very informative in this respect.[35] (3) The structure of consumption was much different after 1933. Proteins were clearly redistributed in favour of the military and probably to special National Socialist institutions such as the *Reichsarbeitsdienst* (obligatory labour camps for young adults). More meat was served in restaurants than in private households, which was probably not beneficial for children's consumption (Bundesarchiv Berlin NS 5 VI 8983, pp. 51–52). It is not surprising that price controls brought about black-market activities. Contemporary reports often mentioned the unwillingness of farmers to deliver fat and protein-rich products to the state food-collecting institutions.[36] The removal of Jewish cattle traders had a further damaging impact on market structure. Police and administration reports concerning the Bavarian district of Ebermannstadt make clear the nature of black-market activities (Broszat and Froehlich, 1979). In September 1935, for example, the district administration reports that after the *Milchversorgungsverband* (milk-supply union) fixed the quota, there was "a great dissatisfaction among farmers. Food prices have risen . . . . The maximum price for cattle sales has often been exceeded and some farmers have not delivered the milk fat to the *Rahmsammelstellen* (milk-fat collection places), but instead they produced butter on their own and sold it on the black market" (p. 164).[37] One year later, in June 1936, the local police reported, that "prices for cattle, butter, and eggs are very high at the moment. Some of the farmers are very unhappy about the laws on butter, milk, and eggs" (p. 172). In September, another police station noted that "farmers unwilling to deliver their milk to the dairy farm (*Molkerei*) Plunck as the price of 12 *Pfennig* is too low" (p. 177, "Plunck" is the name of the dairy farm). In November, the district administration recorded that "the milk delivery duty is still meeting with difficulties in some communities. Again and again, people try to produce butter illegally and sell it. The police are instructed to apply more rigid (*verschärfte*) controls and to act without consideration (*rücksichtslos*). During a control at the railway station in the village of Unterleinleiter a few days ago, no less than 193 lb of butter was confiscated from four female traders, who planned to transport it"

[35] In addition, consumption of some important goods even declined drastically at the national level, such as eggs (because of declining imports). And, even if it is true that imports were increasing from the low of the Great Depression, they were certainly not increasing as strongly as in other countries (and as expected from the income increase).

[36] Of course, lobbies tend to complain when there is an expectation that political powers will provide subsidies, so complaints do not inform us about the price that would have prevailed without the price control system, or without autarky: Corni reports complaints about the incomes of farmers that decreased each year relative to other social groups. (It might have declined anyway) (Corni, 1990, p. 104). Their complaints about low prices are numerous. Consumers on the other hand were also dissatisfied, because of the rising prices. (They might have risen more without price controls).

[37] If the price of beef was allowed to move, how was it possible that a maximum price of cattle is mentioned in the sources? The answer is that the system of "Spannenpreise" (scope prices) that allowed the beef price to move within a boundary, but not beyond a maximum price.

Table 10
Regressions: determinants of mortality increase in Prussian cities, 1932–1938

Regressions	Total mortality	Pneumonia mortality
Import region	5.76 (0.01)	17.24 (0.06)
City size (>100,000)	17.69 (0.00)	
City size (50,000–100,000)	10.50 (0.00)	
City size (30,000–50,000)	7.40 (0.00)	
Industry (%)	0.59 (0.00)	0.74 (0.09)
Jewish (%)	−3.32 (0.03)	
Older than 65 years	0.32 (0.00)	0.38 (0.32)
Constant	−32.38 (0.00)	−10.21 (0.54)
Adjusted R^2	0.41	0.04
N	184	192

P-values are in parentheses. Source: Fig. 11 and Statistik des Deutschen Reiches, various issues. There is no strong multicollinearity among the variables (according to the multicollearity indicator "varaince inflation factor").

(p. 178). These numerous black-market activities demonstrate how deep-reaching were the effects of the market disintegration brought about by the Nazi government's price-regulation policy.

We test the impact of several variables on mortality in 192 Prussian cities for 1932 and 1938, and on 66 German counties (*Regierungsbezirke*) for 1932 and 1936 using regression analyses (Table 10). We control for the increase in the share of old people to control for an age structure effect in the cities. This variable does have an influence on total mortality (column 1) but not on pneumonia mortality (column 2). The dummy variable for "import region" (coastal regions plus regions along the lower banks of the Rhine, Elbe, and Oder rivers) has a strong effect, even after controlling for age structure. The mortality increase was almost 6% higher there. City size was an independent important factor. Again, the largest cities suffered most, experiencing an increase 18% higher than the small towns (represented by the constant). The occupational share in industry has an additional influence that is economically important. More administrative or partially agricultural towns were doing better during that period, with industrial cities suffering more.[38] The goodness-of-fit measure (adjusted R^2) indicates that the percentage of explained variance is a remarkable (41%). It is much higher than in the second regression that considers pneumonia-mortality increases separately. However, pneumonia was also much more influential in the import region and in industrial towns. The Jewish share and the city-size dummies are insignificant.

The non-Prussian South was included in the county-level regressions (Table 11). As an alternative to the import-region dummy we inserted the purchasing power of beef (a protein-availability indicator) in column 2. This model explains even more of the interregional variation of the mortality increase than column 1, with an adjusted R^2 of 0.51. The Jewish share is insignificant. Increasing crude birth rate contributed in fact to the mortality

[38] We inserted the Jewish-population share in the regression in order to control for potential direct effects of persecution. This variable turns out to be negative, contrary to expectations. It is unclear why a higher Jewish share could have reduced mortality, but we can conclude that the rise in mortality of the population was not caused by the persecution.

Table 11
Regressions: determinants of county-level mortality increases (Regierungsbezirke 1932–1936)

	(1)	(2)
Import region (dummy)	4.05 (0.00)	
Purchasing power of beef (increase in percentage)		−0.51 (0.00)
Fertility change (%)	0.31 (0.00)	0.27 (0.00)
Unemployment 1933 (%)	−0.13 (0.00)	−0.26 (0.02)
Jewish (%)	0.02 (0.83)	−0.16 (0.15)
Constant	2.42 (0.26)	6.88 (0.00)
Adjusted R^2	0.37	0.51
N	66	66

P-values are in parentheses. Source: Statistik des Deutschen Reiches, various issues. There are no strong multicollinearities (according to VIF).

upsurge as contemporaries had argued—but it did not affect the significance of the import region or the beef-purchasing power variable. The unemployment share in 1933 denotes particular crisis regions in 1933 that presumably improved more than the average until 1936. Thus, the higher was the unemployment in 1933 the smaller was the increase in mortality.[39] The regression analysis indicates that mortality did, in fact, increase most in the large industrial cities and in those coastal regions of the Northwest that depended heavily on imported protein. That holds true even after controlling for changes in fertility, age structure, and unemployment.

6. Conclusion

We conclude that an autarchy policy was, indeed, highly detrimental to the health in an industrialised food-importing economy. Price and quantity regulations did not alleviate the situation, for people living in large cities. We compare trends in mortality and nutritional status with other living standard indicators for the Weimar Republic (1919–1933) and for the early years of the Nationalist Socialist regime (1933–1937). The findings reveal a little known fact that in the mid-1930s mortality rates in Germany increased substantially in almost every age group, even if compared to those in 1932, the worst year of the Great Depression. Moreover, children's heights—an indicator for health and quality of nutrition—were generally stagnating between 1933 and 1938, but had increased significantly during the 1920s. Persecution alone does not explain such an acute crisis in biological well-being; the non-persecuted segments of the German population were affected as well. Rearmament expenditures increased at the expense of public health measures. Food imports were

[39] Is there evidence that the increase in diphtheria was related to malnutrition? We ran separate regressions—that are not shown here, but are available from the authors—on the rate of diphtheria increase. It was also strongly influenced by the protein scarcity indicator (purchasing power of beef). We explored whether lack of physicians could have contributed to regional diphtheria increase. However, the sign of the variable "increase in physicians per capita" is positive and significant. This suggests that causality ran the other way around: increases in diphtheria lead health authorities to increase the number of physicians per capita in the regions most affected.

curtailed, and prices of many agricultural products were controlled. There is ample evidence that this set of policies had an adverse effect on the nutritional status and the health of the German population. Specifically, suffering most from the policy of restricting imports of protein-rich agricultural products were the highly developed regions with large urban sectors and the coastal regions of the Northwest.

The economic policy of the National Socialists is often considered the one aspect in which they were successful (Hildebrand, 1989). The popular impression is based on the dramatic reduction of unemployment that had been extremely high during the Great Depression.[40] Totalitarian governments can reduce unemployment through public works projects and massive military spending, as well as stimulate profit expectations of industrialists within the framework of an imminent armament boom. Buchheim showed that Germany's recovery had actually started before Hitler's economic policy could have had an effect (except a psychological one that influenced expectations) (Abelshauser, 1999, pp. 503–538; Buchheim, 2001). Yet, the image of the Nazis ending unemployment is still dominating the popular view of German living standards in the 1930s. A discussion of the biological standard or living is necessary to modify that common wisdom. In sum, the Nazi economic policy was—in contrast to most interpretations—not successful in raising the biological welfare of the majority of the German population even prior to the outbreak of war. Rather, it produced a considerably adverse development in both morbidity and mortality.

Acknowledgements

I wish to thank the Fritz Thyssen Stiftung for supporting this research (A.W.).

References

Abelshauser, W., 1999. Kriegswirtschaft und Wirtschaftswunder. Deutschlands wirtschaftliche Mobilisierung für den Zweiten Weltkrieg und die Folgen für die Nachkriegszeit. Vierteljahreshefte für Zeitgeschichte 47, 503–538.

Baten, J., 2000. Height and real wages: an international overview. Jahrbuch für Wirtschaftsgeschichte 2000 (1), 17–32.

Baten, J., 2002. Does communism and nationalsocialism make you shorter and die earlier? Wirtschaftsordnung und Biologischer Lebensstandard. In: Denzel, M., Goemmel, R. (Eds.), Weltwirtschaft und Wirtschaftsordnung. Steiner Verlag, Stuttgart, pp. 315–326.

Blasius, D., 1996. Tuberkulose: Signalkrankheit deutscher Geschichte. Geschichte in Wissenschaft und Unterricht 47, 320–332.

Broszat, M., Froehlich, E., 1979. Alltag und Widerstand—Bayern im Nationalsozialismus. Piper, München/Wien.

Bry, G., 1960. Wages in Germany. University Press, Princeton.

Buchheim, C., 1994. Zur Natur des Wirtschaftsaufschwungs in der NS-Zeit. In: Buchheim, C., et al. (Eds.), Zerrissene Zwischenkriegszeit. Wirtschaftshistorische Beiträge. Knut Borchardt zum 65. Geburtstag. Nomos-Verlagsgesellschaft, Baden-Baden, pp. 97–119.

Buchheim, C., 2001. Die Wirtschaftsentwicklung im Dritten Reich—mehr Desaster als Wunder. Vierteljahreshefte für Zeitgeschichte 49, 653–664.

[40] The Austrian populist politician, Joerg Haider, has become infamous with his statement, that Hitler had "a proper employment policy" (*eine ordentliche Beschäftigungspolitik*).

Bundesarchiv Berlin NS 5 VI 8983, Der deutsche Volkswirt Nr. 47 vom 25. August 1939, pp. 51–52.
Corni, G., Gies, H., 1997. Brot—Butter—Kanonen. Die Ernährungswirtschaft in Deutschland unter der Diktatur Hitlers. Akademie Verlag, Berlin.
Corni, G., 1990. Hitler and the Peasants. Agrarian Policy of the Third Reich, 1930–1939. Berg, New York.
Dasgupta, P., Weale, M., 1992. On measuring the quality of life. World Development 20, 119–131.
Dinkel, R.H., 1985. The seeming paradox of increasing mortality in a highly industrialized nation: the example of the Soviet Union. Population Studies 39 (1), 87–97.
Drukker, J.W., Tassenaar, V., 1997. Paradoxes of modernization and material well-being in The Netherlands during the nineteenth century. In: Steckel, R., Floud, R. (Eds.), Health and Welfare during Industrialisation. The University of Chicago Press, Chicago/London, pp. 331–337.
Dumke, R., 1991. Income inequality and industrialization in Germany, 1850–1913: the Kuznets hypothesis reexamined. In: Brenner, Y.S., et al. (Eds.), Income Distribution in Historical Perspective. Cambridge University Press, Cambridge, pp. 117–148.
Floud, R., Harris, B., 1997. Health, height and welfare: Britain, 1700–1900. In: Steckel, R., Floud, R. (Eds.), Health and Welfare During Industrialisation. The University of Chicago Press, Chicago/London, pp. 91–126.
Franklin, H.L., 1940. Wartime Agriculture and Food Control in Germany. Foreign Agriculture, April 1940, pp. 181–220, cited from Bundesarchiv Berlin NS 5 VI 8983, pp. 17–18, Hunger in Deutschland? Betrachtung einer Studie Deutschlands Kriegsernährung. Vierteljahreshefte fuer Wirtschaftsforschung 2/3, 21.4.41, pp. 158–159.
Geyer, M.H., 1989. Soziale Sicherheit und wirtschaftlicher Fortschritt. Überlegungen zum Verhältnis von Arbeitsideologie und Sozialpolitik im ‘Dritten Reich’. Geschichte und Gesellschaft 15, 382–406.
Gumpert, M., 1940. Heil Hunger! Health under Hitler. Allen & Unwin, London.
Gundel, M., 1936. Die aktive Schutzimpfung gegen Diphterie und die Ergebnisse der in den Jahren 1934 und 1935 in Deutschland durchgeführten Diphtherieschutzimpfungen. Veröffentlichungen aus dem Gebiete des Volksgesundheitsdienstes 416, vol. 475.
Hachtmann, R., 1988. Lebenshaltungskosten und Reallöhne während des Dritten Reichs. Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte 75, 32–73.
Hachtmann, R., 1989. Industriearbeit im Dritten Reich. Untersuchungen zu den Lohn- und Arbeitsbedingungen in Deutschland 1933–1945. Vandenhoeck & Ruprecht, Göttingen.
Hammonds, E., 1999. Childhood’s deadly scourge. In: The Campaign to Control Diphtheria in New York City, 1880–1930. The Johns Hopkins University Press, Baltimore/London.
Hecker, R., 1954. Gesundheitsfürsorge für das Kind im Schulalter. In: Hecker, R., et al. (Eds.), Grundriß der Gesundheitsfürsorge. Ernst Reinhardt, München/Basel, pp. 106–117.
Hermanussen, M., 1997. Catch-up in final height after unification of Germany. Acta Medica Auxologica 29 (3), 135–141.
Hildebrand, K., 1989. Das Daitte Reich (Oldenbourg Grundriss der Geschichte 17), Oldenbourg, München.
Hinze, S., 1993. Die ungewöhnlich geduldigen Deutschen, Arbeiterleben 1934–1936 im Spiegel ausgewählter Gestapodokumente (Regierungsbezirk Potsdam). In: Eichholtz coop, Püschel, A. (Eds.), Brandenburg in der NS-Zeit. Studien und Dokumente. Verlag Volk und Welt, Berlin, pp. 32–62.
Hitzler, H., 1952. Der Wirkungskreis der Allgemeinen Ortskrankenkasse im Gesundheitswesen der Stadt Frankfurt am Main in den Jahren 1924 bis 1950, Doctoral thesis, Frankfurt a. Main.
Hoffmann, W.G., et al., 1965. Das Wachstum der deutschen Wirtschaft seit der Mitte des 19. Jahrhunderts. Duncker & Humblot, Berlin.
Kater, M., 1989. Doctors under Hitler. The University of North Carolina Press, Chapel Hill/London.
Knödler, U., 1991. Von der Reform zum Raubbau. Arbeitsmedizin, Leistungsmedizin, Kontrollmedizin. In: Frei, N. (Ed.), Medizin und Gesundheitspolitik in der NS-Zeit (Schriftenreihe der Vierteljahrshefte für Zeitgeschichte, Sondernummer). Oldenbourg, München, pp. 113–136.
Komlos, J., 1999. On the biological standard of living in Russia and the Soviet Union. Slavic Review 58 (1), 71–79.
Kranig, A., 1992. Arbeitnehmer, Arbeitsbeziehungen und Sozialpolitik unter dem Nationalsozialismus. In: Bracher, K.D., et al. (Eds.), Deutschland 1933–1945. Neue Studien zur nationalsozialistischen Herrschaft. Bundeszentrale für politische Bildung, Bonn, pp. 135–152.
Kümmel, W., 1993. ‘Die Ausschaltung’—Wie die Nationalsozialisten die jüdischen und die politisch mißliebigen Ärzte aus dem Beruf verdrängten. In: Blekker, J., Jachertz, N. (Eds.), Medizin im “Dritten Reich”. Deutscher Ärzte-Verlag, Köln, pp. 70–77.

Lewis, J., 1986. The prevention of diphtheria in Canada and Britain 1914–1945. Journal of Social History 20, 163–176.
Lunn, P.G., 1991. Nutrition, immunity and infection. In: Schofield, R., et al. (Eds.), The Decline of Mortality in Europe. Clarendon Press, Oxford, pp. 131–145.
Maddison, A., 1995. Monitoring the World Economy 1820–1992. OECD, Paris.
Marcusson, H., 1962. Die Gesundheit des Kindes im Vorschulalter. Verlag Volk und Wissen, Berlin.
Mason, T., 1977. Sozialpolitik im Dritten Reich. Arbeiterklasse und Volksgemeinschaft. Westdeutscher Verlag, Opladen.
Mironov, B.N., 1999. Tall requirements and small reality. Slavic Review 58 (1), 80–90.
Mitchell, B., 1988. British Historical Statistics. Cambridge University Press, Cambridge.
Mitchell, B., 1992. International Historical Statistics: Europe 1750–1988. MacMillan, Basingstoke.
Morgan, S., 1988. Biological indicators of change in the standard of living in China during the 20th century. In: Komlos, J., Baten, J. (Eds.), The Biological Standard of Living in Comparative Perspective. Steiner, Stuttgart, pp. 7–34.
Naumann, K., 1941. Stillhäufigkeit und Stilldauer in einem westdeutschen Landkreis. Der öffentliche Gesundheitsdienst 7 (14), 417–421.
Oppenheimer-Bluhm, H., 1965. The Standard of Living of German Labor under Nazi Rule. New York, 1943 (reprint (Kraus, New York).
Overy, R.J., 1994. War and Economy in the Third Reich. Clarendon Press, Oxford.
Petzina, D., 1977. Die deutsche Wirtschaft in der Zwischenkriegszeit. Steiner, Wiesbaden.
Petzina, D., et al., 1978. Sozialgeschichtliches Arbeitsbuch. III. Materialien zur Statistik des Deutschen Reichs 1914–1945. Beck, München.
Pine, L., 1997. Nazi Family Policy 1933–1945. Berg, Oxford/New York.
Proctor, R., 1999. The Nazi War on Cancer. Princeton University Press, Princeton/New York.
The Registrar-General's Statistical Review of England and Wales of the Year 1938. Majesty's Stationery Office, London, 1940.
Riphahn, R., 1999. Die Mortalitätskrise in Ostdeutschland und ihre Reflektion in der Todesursachenstatistik. Zeitschrift für Bevölkerungswissenschaft 24 (3), 329–363.
Ritschl, A., 2002. Deutschlands Krise und Konjunktur: Binnenkonjunktur, Auslandsverschuldung und Reparationsproblem zwischen Dawes-Plan und Transfersperre 1924–1934. Akademie Verlag, Berlin, Beihefte 2. Jahrbuch für Wirtschaftsgeschichte.
Sachße, C., Tennstedt, F., 1992. Der Wohlfahrtsstaat im Nationalsozialismus. Geschichte der Armenfürsorge, vol. 3. Kohlhammer, Stuttgart.
Seidlmayer, H., 1937. Geburtenzahl, Säuglingssterblichkeit und Stillung in München in den letzten 50 Jahren. Doctoral thesis, München.
Siegel, T., 1982. Lohnpolitik im nationalsozialistischen Deutschland. In: Sachse, C., et al. (Eds.), Angst, Belohnung, Zucht und Ordnung. Herrschaftsmechanismen im Nationalsozialismus. Westdeutscher Verlag, Opladen, pp. 54–139.
Silverman, D., 1988. National socialist economics: the wirtschaftswunder reconsidered. In: Eichengreen, B., Hatton, T. (Eds.), Interwar Unemployment in International Perspective. Kluwer Academics Publishers, Dordrecht, pp. 185–220.
Spree, R., 1992. Der Rückzug des Todes. Der Epidemiologische Übergang in Deutschland während des 19 und 20. Jahrhunderts. Universitätsverlag, Konstanz.
Statistisches Bundesamt Wiesbaden (Ed.), 1972. Bevölkerung und Wirtschaft 1872–1972. Kohlhammer, Stuttgart/Mainz.
Süß, W., 1998a. Gesundheitspolitik. In: Hockerts, H.G. (Ed.), Drei Wege deutscher Sozialstaatlichkeit. NS-Dikatur, Bundesrepublik und DDR im Vergleich (Schriftenreihe der Vierteljahreshefte für Zeitgeschichte 76). Oldenbourg, München, pp. 55–99.
Süß, W., 1998b. Krieg und Gesundheitspolitik im nationalsozialistischen Deutschland 1939–1945. Unpubliched doctoral thesis, München.
Szerreiks, 1939. Über Ergebnisse von Röntgenreihenuntersuchungen in ihrer Beziehung zur D.B.-Frage bei Lungentuberkulose. Veröffentlichungen aus dem Gebiete des Heeres-Sanitätswesens 108, 72–126.
Tanner, J.M., 1990. Foetus into Man: Physical Growth from Conception to Maturity. Harvard University Press, Cambridge.

Tanner, J.M., 1994. Introduction: growth in height as a mirror of the standard of living. In: Komlos, J. (Ed.), Stature, Living Standards an Economic Development. Essays in Anthropometric History. The University Chicago Press, Chicago/London, pp. 1–6.

Tennstedt, F., 1976. Sozialgeschichte der Sozialversicherung. In: Blohmke, M., et al. (Eds.), Sozialmedizin in der Praxis. Handbuch der Sozialmedizin, vol. 3. Enke, Stuttgart, pp. 385–492.

US Department of Commerce, 1975. Historical Statistics of the United States from Colonial Times to 1970, Part 1. GPO, Washington, DC.

Van der Bussche, H., 1993. Ärztliche Ausbildung und medizinische Studienreform im Nationalsozialismus. In: Blekker, J., Jachertz, N. (Eds.), Medizin im "Dritten Reich". Deutscher Ärzte-Verlag, Köln, pp. 117–128.

Vierteljahreshefte zur Statistik des Deutschen Reichs, 1938.

Von der Decken, H., 1937/1938. Die Ernährung in England und Deutschland. Vierteljahrshefte zur Wirtschaftsforschung 12, 177–199.

Von der Lippe, P., 1996. Die politische Rolle der amtlichen Statistik in der ehemaligen DDR. Jahrbücher für Nationalökonomie und Statistik 215 (6), 641–673.

Wagner, A., Ein Human Development Index für Deutschland. Die Entwicklung des Lebensstandards von 1920 bis 1960. Jahrbuch fuer Wirtschaftsgeschichte, in press.

Werner, W.F., 1983. Bleib übrig! Deutsche Arbeiter in der nationalsozialistischen Kriegswirtschaft. Schwann, Düsseldorf.

Wheatcroft, S.G., 1999. The great leap upwards: anthropometric data and indicators of crises and secular change in Soviet welfare levels, 1880–1960. Slavic Review 58 (1), 27–60.

Wu, J., 1992. The anthropometric history of Pittsburgh and Allegheny County, Pennsylvania, 1890–1945. Annals of Human Biology 19, 79–86.