Table V.5
Average systolic blood pressures: Japanese* and American** applicants for life insurance. Age groups 45–65 (mmHg)

	United States		Japan	
Age Group	Systolic BP	% ≥150	Systolic BP	% ≥150
45+	130.0	13.4	130.6	17.3
50+	134.5	20.2	137.2	26.3
55+	137.8	26.3	138.2	29.7
60+	141.8	34.9	144.0	39.8

* 75,000 (including females; not separately tabulated).
** 269,583 males (86% of applicants).

Reprinted from Henry A Schroeder, 'Degenerative cardiovascular disease in the Orient. II hypertension', *J Chron Dis*, 1958, **8**: 312–33, p. 315. (With permission from Elsevier Science.)

housing shortage.[48] Salt intake was high in Japan, estimated at 10 to 15 g daily per person, and may have been a factor contributing to the proportion of middle-aged men with elevated systolic blood pressures being higher in Japan than in the United States (Table V.5), possibly a cause for the then very high Japanese incidence of cerebral haemorrhage.[49] In the balance, the role of animal fat intake, harmful when excessive but beneficial when restricted, overrides other lifestyle risk factors in importance.

Faith and Fish

Some further developments in eighteenth-century English dietary practices may have had their origins in changes in religious observance. The Reformation in England resulted initially in establishment of a national church that retained many features of Catholicism, and even after the Elizabethan modifications, it resulted in a form of Protestantism less extreme than was usual on the continent.[50] There was consequently a tendency to retain some Roman Catholic dietary laws, particularly periodic abstinence from meat. These restrictions were reinforced by sixteenth-century civil laws designed to protect the fishing fleet, a potential source of men for the navy. Eating meat was prohibited during Lent, on all Fridays and on occasion on Wednesday. These were designated fish days. The laws were civil, but the choice of days and times Roman Catholic in origin.[51] All of this resulted in over a quarter

[48] Michael G Marmot and George Davey Smith, 'Why are the Japanese living longer', *Br Med J*, 1989, **299**: 1547–51, p. 1547.
[49] Henry A Schroeder, 'Degenerative cardiovascular disease in the Orient. II Hypertension', *J Chron Dis*, 1958, **8**: 312–33, pp. 315, 320.
[50] G R Elton, *England under the Tudors*, London, Methuen, 1974, pp. 156, 271–6.
[51] George Macaulay Trevelyan, *English social history*, London, Longman, 1978, p. 189.

of the year, a total of about 100 days, on which meat could not be eaten and fish was to be substituted.

During the late seventeenth and the eighteenth centuries the civil dietary restrictions lapsed and there was a considerable decline in Anglican religious observances, especially those of a ritual nature. This occurred to some extent when the Hanoverian succession became imminent and High Church practices aroused suspicion of Jacobite sympathies. However, following the failure of the 1745 uprising led by Bonny Prince Charlie, the need for militant Protestantism lessened as the High Church became fully reconciled to the House of Hanover.[52] As the possibility of a Stuart restoration faded so did the intensity of Protestant held attitudes. At this time the Church of England also lost followers to the growing nonconformist movements, possibly in part because of complacency in the face of challenges by dissenting communities and more certainly because of failure of the Church to move its physical presence into the new and growing centres of population.[53] The influence of rationalist movements grew during the late Stuart and the Georgian eras and amongst religious intellectuals there was increasing emphasis on personal integrity rather than strict belief and ritual orthodoxy. As a measure of its extent, no less a person than John Tillotson, Archbishop of Canterbury in the years following the Glorious Revolution of 1689, considered that doctrine stood or fell by its consonance with reason.[54] Meanwhile, the Toleration Act of 1689 had resulted in lessened coercion in connection with the observance of Anglican rites, and led ultimately to their 1779 removal by a further Act of Parliament.[55] All of these factors contributed to a decline in adherence to religious dietary practices. As a result there were about 100 days in the year when eating meat (with its attendant high fat content) became allowable.

This increase might well of itself have contributed appreciably to the development of coronary heart disease. Whether the concurrent fall in consumption of fish is to be judged contributory as well depends on an assessment of any possible protective role of fish, the evidence for which warrants consideration. Comparisons have been made between CHD incidence in populations with varying fish intake but the results of studies based on responses of individuals to questionnaires about food intake, with all their accompanying uncertainties, have not been consistent. Studies based on nationwide estimates of consumption have also yielded varying results. A recent review by M B Katan attempted to reconcile the inconsistencies by suggesting an all or none threshold effect. It was noted that groups having a fairly low fish intake, perhaps one or two servings a week, appeared to enjoy a lessening in coronary disease incidence, but no further reduction with greater fish consumption was evident.[56] It would be hard therefore to demonstrate any benefits of increasing fish intake in a population in which the lowest level of consumption was already above

[52] Ibid., pp. 356, 55.

[53] Frank O'Gorman, *The long eighteenth century: British political and social history 1688–1832*, London, Arnold, 1997, p. 295.

[54] Mark Goldie and John Locke, 'Jonas Proast and religious toleration 1688–92', in John Walsh, Colin Haydon and Stephen Taylor (eds), *The Church of England c.1689–c. 1833: from toleration to tractarianism*, Cambridge University Press, 1993, p. 161.

[55] O'Gorman, op. cit., note 53 above, p. 308.

[56] M B Katan, 'Fish and heart disease', *N Engl J Med*, 1995, **332**: 1024–5, pp. 1024, 1025.

Table V.6
Age adjusted death rates per 10,000 person-years according to baseline fish consumption

Fish consumption (g/day)	Death rates/10,000 person-years
0	78.6
1–17	69.2
18–34	57.9
≥35	45.3

Adapted from data published by M L Daviglus *et al.*, 'Fish consumption and the 30-year risk of fatal myocardial infarction', in *N Engl J Med*, 1997, **336**: 1046–53, p. 1049.

any theoretical threshold. Support for the threshold concept was also provided by an analysis of findings reported by Alberto Ascherio and co-workers. This showed that during the period under review the death rate from coronary heart disease was about 25 per cent lower among men who regularly ate at least some fish when compared to those who ate none at all, but the mortality rate was not lower still in a third group of men who consumed larger amounts.[57]

The findings of Daan Kromhout and his colleagues contrasted with those of Katan and Ascherio. They compared, *inter alia*, the outcomes when elderly Dutch subjects who ate varying amounts of fish regularly were compared with "no-fish" eaters. In the course of a twenty-year follow-up, the risk ratio for CHD of the latter was 1.0 by definition, but the former only 0.60. The difference remained significant after correction for the usual confounders. More importantly, among the entire group of fish eaters, the risk ratio for coronary heart disease decreased progressively with increasing amounts of fish consumed, a finding which casts doubt on the threshold concept.[58] Several other investigations involving large numbers of subjects and with long term follow-up have also been able to demonstrate progressive benefits with increasing consumption. A further noteworthy example in this respect is provided by the results of the Chicago Western Electric Company study which involved 1,822 men, 47,153 person-years of follow-up and 430 deaths from coronary heart disease that became available for analysis. A significant reduction in CHD death rates that could be related to fish consumption was demonstrated, with benefits directly proportional to the amount consumed (Table V.6).[59] In general more findings negate rather than favour the concept of a threshold, but irrespective of this, the investigations are, by and large, in agreement in indicating that, as far as coronary heart disease is concerned, fish has a protective role.

There is also evidence to suggest that fatty fish, such as mackerel or herring,

[57] Alberto Ascherio *et al.*, 'Dietary intake of marine n-3 fatty acids, fish intake, and the risk of coronary heart disease among men', *N Engl J Med*, 1995, **332**: 977–82, p. 979.

[58] Daan Kromhout, Edward B Bosschieter and C de Lezenne Coulander, 'The inverse relation between fish consumption and 20-year mortality from coronary heart disease', *N Engl J Med*, 1985, **312**: 1205–9, p. 1206.

[59] M L Daviglus *et al.*, 'Fish consumption and the 30-year risk of fatal myocardial infarction', *N Engl J Med*, 1997, **336**: 1046–53, p. 1049.

have a specific beneficial effect.[60] Fish consumption does not directly affect serum cholesterol levels significantly.[61] However, the long carbon chain fatty acids present in fish have been found to reduce platelet aggregation in response to contact with the physiological stimulants collagen and adenosine diphosphate. They have therefore a mild anticoagulant effect of potential value in protecting against clot formation in coronary arteries.[62] Such fatty acids are important constituents of fish oil and this may be a basis for beneficial effects of fish consumption on CHD incidence. Lastly, fish oil has been found to improve endothelium dependent coronary arterial relaxation in patients with established coronary heart disease (page 72), thus facilitating an increase in blood flow to the heart in response to need.[63]

In conclusion, eighteenth-century changes in eating habits with a decline in religious observance of dietary constraints and a fall into abeyance of legal restrictions on meat consumption may have resulted in an appreciable fall in fish consumption, possibly to below a suggested critical threshold level. Reduced intake of fish with loss of its various beneficial effects could have contributed to the rising eighteenth-century coronary heart disease incidence, with its concurrent replacement by fatty animal foods constituting an inter-related additional risk factor.

Fibre

Some of the greatest changes in farming in Georgian England related to the growing of cereals and, in particular, to a shift in emphasis from coarse grains to wheat; the relative importance of oats and rye declining while that of wheat rose. With abandonment of the strip system and other improvements in methods of cultivation during the eighteenth century, yields of wheat and oats, as measured in bushels per acre, increased in roughly similar proportions, by about one-eighth in the case of the former and one-sixth in the latter. However, the acreage under wheat rose between 1695 and 1750 from about one and a third million to over 2 million acres, but the increase under oats was much less, from 1.22 to 1.44 million acres. As a result, wheat production increased by 73.5 per cent, almost exactly double the 37.5 per cent rise in the yield of oats. During the last half of the eighteenth century the rate of increase in the amount of wheat harvested rose sharply while the rate of rise in oat production lessened somewhat (Table V.7).[64] As a result oat production fell considerably as a proportion of total cereal output while that of wheat rose. The absolute amount of oats available for human consumption actually declined during this time. In 1696 the horse population of England was estimated by Gregory King

[60] M L Burr *et al.*, 'Effect of changes in fat, fish and fibre intakes on death and myocardial reinfarction: diet and reinfarction trial', *Lancet*, 1989, **ii**: 757–61, p. 759.

[61] Kromhout, Bosschieter, Coulander, op. cit., note 58 above, p. 1206.

[62] Schacky and Weber, op. cit., note 33 above, pp. 2447–8.

[63] Vekshtein *et al.*, op. cit., note 32 above, p. 434.

[64] B A Holderness, 'Prices, production and output', in G E Mingay (ed.), *The agrarian history of England and Wales, Volume VI: 1750–1850*, Cambridge University Press, 1989, p. 145.