Continuity and Change **13** (*1*), *1998, 73–115. Printed in the United Kingdom*

Stature and relative deprivation: fatherless children in early industrial Britain

SARA HORRELL,* JANE HUMPHRIES† AND HANS-JOACHIM VOTH‡

I

Economic historians and development economists have exploited links between nutrition, health status and physical stature to argue that evidence about height can be used to supplement conventional economic indices of well-being. Evidence on stature may be available for time periods when conventional economic indices are not. It may also exist for sections of populations for which only aggregate income data is available, and so expose variations in living standards within populations: indeed this may be its most important contribution. Moreover height is an aggregate function of many aspects of well-being, including real income, work intensity and the disease environment. Unlike real income data it can reflect net environmental factors such as arduous employment at an early age that is not fully offset by inputs of food and health care.

This article exploits these potentially useful attributes of the anthropometric approach to explore a neglected aspect of inequality in early industrial Britain and to try to capture evidence of the net effect of relative deprivation through cross-sectional analyses of heights. Children in families headed by women comprise the subsample on which we focus. Considerable qualitative and some quantitative evidence exists to suggest that children in such families were relatively deprived. Female-headed

* Faculty of Economics, University of Cambridge.
† Faculty of Economics, University of Cambridge.
‡ Department of Economics, Stanford University, California.

households were impoverished by the relatively low earning power of women, which was only partially offset by poor relief. But oppressive poverty was not alone in making these children's lives hard. Evidence suggests that they comprised a disproportionate share of child workers in the mines and manufactories of early industrial Britain. They were put to work early and at jobs which involved long hours and although their efforts augmented family incomes, given the poverty within which such families remained it is unlikely that the children's claim on resources was sufficiently boosted to offset the energy required by their employment.

Other characteristics of these families may also have worked to disadvantage children in them. Women heads of households were themselves more likely than other women to be employed, and consequently less able to care for their children. A variety of disadvantages may have ensued. At the most basic level, food expenditure may have been skewed towards more easily prepared but less nutritious items. More dramatically, working mothers may have been more inclined than others to use opiates to keep their children quiet and immobile while they worked, a practice allegedly associated with subsequent stunting. Mothers who worked may not have had time to attain even the same doubtful standards of cleanliness for their children that non-working poor mothers achieved. Poverty may have operated through lack of personal hygiene and thence through disease to affect stature. Female-headed households, driven to economize on rent, were probably also disproportionately represented in the worst housing of the early industrial cities.

In Section II below, a variety of data sources will be used to document the relative poverty of female-headed households and the greater likelihood that children in these families were not only employed but employed at younger ages and at tasks which were demanding of physical effort and endurance. In particular, we use evidence from a data set of household budgets originally collected over the course of the industrial revolution and supplement this with histories taken from working-class autobiographies. Section III turns to more speculative arguments about the expenditure patterns of female-headed households and presents some new evidence from the household budgets mentioned above. Fragmentary evidence linking female-headship to uncleanliness and the use of opiates is also considered. Section IV reports evidence from a classic source of data on stature in industrializing Britain, Marine Society records. These show that children presented to the Society by female relatives, and so presumably originating in female-headed households, were significantly shorter than other London boys. Section V addresses the implications of the associations we have revealed. One important insight concerns the consistency of the anthropometric approach to well-being itself. If

children from female-headed households were relatively deprived, then the composition of samples must be checked to make sure that changes in the proportions of fatherless children did not influence averages which are then taken to be representative of trends in the population. More generally, the study shows how an anthropometric approach can be used to identify groups whose living standards were distinctive and so guide the search for both the immediate and more fundamental causes of progress and poverty.

II

The poor widow is a main character in many fairy tales, and the struggle she faced in raising her fatherless children provided a standard subplot. Up to a point (the happy ending?), these representations capture the historical reality faced by women without men. At any one time during the industrial revolution around 9 per cent of all households in England and Wales with children were headed by women but they were represented in higher proportions in populations identified as 'poor'.[1] Surveys of the poor, for example, usually revealed more women with dependent children among the poor than occurred in the population as a whole. For example, in a survey on Ashton and Haydock, in West Derby, south-west Lancashire, in 1815, 38 Haydock families were found to have an income per head of four shillings or less per week.[2] Of these families 28 contained children, and women headed 8 of them. Thus female-headed households represented 29 per cent of poor families with children. Moreover, the female-headed households represented many of the poorest families in the sample, with six out of eight such families living on less than a shilling a head per week. Lone mothers were similarly over-represented among the poor of Ashton, where about one-third of poor families with children were headed by women. Another south-west Lancashire survey, in the district of Bedford, conducted by the Select Vestry in 1836, listed the names, ages and incomes of every member of every family which was or sought to be on permanent relief.[3] Again female-headed households, along with families made up of the elderly, predominated. An 1841 survey of the effects of trade depression in Bolton (also in Lancashire) showed that families headed by widows or deserted females were some of the poorest. Widows' families were common among poor families visited and described in 1843 by Ann Ecroyd, a Quaker philanthropist of Marsden in north-east Lancashire, and were again among the poorest of this impoverished sample.[4] Widows and their children were also heavily represented on lists of beneficiaries of philanthropy, both of extraordinary charitable efforts prompted by particular crises and of private charity extended to specific

individuals.[5] But the clearest evidence on the poverty of these families comes from an examination of lists of families in receipt of poor relief.

Whatever aspect of Poor Law administration is considered, deserted, widowed and unmarried women appear as a major group of recipients, awkwardly straddling distinctions which Poor Law officials sought to make between the deserving and undeserving poor or between the able-bodied and non-able-bodied.[6] Under the Old Poor Law, less than 10 per cent of the men, women and children relieved were relieved in workhouses; the vast majority were helped by small subsidies, in cash and/or in kind, outdoor relief which was not conditional on residence in the workhouse or even subject to a labour test.[7] Admissions registers and lists of inmates show a universal tendency for the workhouse to become a receptacle for the most difficult and long-term cases of poverty, primarily orphans, deserted children and the elderly.[8] But workhouses also contained young mothers who were widowed, deserted or unmarried. Certainly the Old Poor Law's distinction between the deserving and undeserving poor usually denied outdoor relief to the unmarried mother and consigned her and her offspring to the workhouse. Perhaps some lone women with dependent children were unequal to the struggle to survive outside the workhouse even with the help of the small pensions which guardians customarily paid to the 'deserving'. Perhaps Poor Law officials sought to consign some able-bodied but vulnerable women to the workhouse to provide the labour for its domestic management, to care for the elderly and sick, and to clean and cook.[9]

The same groups – the elderly, orphans and lone mothers – were also heavily represented on the lists of recipients of outdoor relief under the Old Poor Law, although here their relative importance was reduced by payments to families with large numbers of children. Knott's data on recipients of outdoor relief at Halifax in 1802, which appear typical in terms of the family types assisted, suggest that 47 per cent of recipients were widows and aged women and 13 per cent 'women with bastards', while old men comprised 13 per cent, the infirm 7 per cent, and men with large families 20 per cent.[10]

The pensions provided to lone mothers under the Old Poor Law reflect a key aspect of much pre-1834 relief. They were supplementary. They were too small to support an individual, let alone a family, and survival needed to be eked out by other sources of income. The chartist Robert Lowery recalled how when sudden death robbed a family of its breadwinner

> the practice [was] to relieve the widows with families liberally at first, so as to enable them, with some of the club money and the aid of friends to get into some mode of employment, such as keeping a mangle, a child's school or a little shop … This policy kept the house

together, as it was called, gave security to the family tie, and encouraged them to hope for better days, while to withhold relief, except they went into the [work]house, would have broken their spirits, destroyed their family bond, and rendered them incapable of struggling to maintain themselves.[11]

The moral and material claim of widows to poor relief without the workhouse test was maintained, though grudgingly, and increasingly grudgingly, into the New Poor Law. Women and the particular economic problems they encountered were not addressed in the 1834 Report of the Royal Commission to Investigate the Poor Laws and women as a group are not mentioned in the Act.[12] Women and particularly those burdened with dependent children were an anomaly within the able-bodied/non-able-bodied classification. The women may have been robust and able to support themselves, albeit at the lower standard that women's wages allowed, but they could not earn enough to support dependent children, particularly when also constrained in the hours they worked by the needs of such children. The perpetuation of the old criteria of deservingness justified the denial of outdoor relief to bastard-bearers, the treatment of whom hardened under the New Poor Law.[13] The ambiguous position of widows probably led to diverse treatment according to the sympathies of the local administrators, their economic circumstances and the particular claims of the individuals. The 1844 General Orders on the one hand affirmed the widow's claim to exemption from the workhouse test, but on the other hand limited that claim to the first six months of widowhood and/or to those women who had dependent children. Moreover the children had to be 'incapable of earning… their livelihood' and the woman could not have any illegitimate children born after the commencement of her widowhood.[14] The case of deserted wives was even more problematical for the administrators of the New Poor Law, creating the spectre of possible collusion and fears about distorted incentives: husbands might be more willing to abandon wives if they knew that the parish would rescue them from destitution and wives might be less willing to tolerate objectionable husbands if they knew that the Poor Law provided an alternative source of economic support. The Commissioners were less inclined to support these women outside the workhouse.

The central directives did not determine policy on the ground in all districts. As is widely known, outdoor relief continued in many parts of the country where local administrators found it both economical and politically preferable.[15] However the directives do represent a significant hardening of policy towards even those lone mothers who were clearly not authors of their own state, that is widows.[16] Over the course of industrialization, lone mothers, while continuing to be recognized as poor

and needy, were increasingly likely to face the workhouse test when they asked to be relieved and there is little evidence to suggest that their relative poverty was ameliorated by more generous or effective assistance.[17]

Other evidence about the composition of the pauper population also testifies to the over-representation of lone mothers. Settlement examinations, which ascertained individuals' place of legal settlement (the place where they had a legal claim on parochial resources), usually indicated that the household head was unemployed and likely to become a claimant of poor relief if not currently chargeable, or at least that the household head was regarded with some suspicion of potential future liability by the local guardians of the rates. These settlement records also suggest that women with dependent children were likely, and were seen to be likely, to need parochial support. On the basis of records of settlement examinations of families with dependent children from rural and market town parishes in south-east England in 1700–1850, Snell and Millar suggest that about a third of all families with dependent children applying for relief were lone parents and that lone mothers predominated among this group, underlining the fact that 'lone mothers were less likely to be able to support themselves than were lone fathers'.[18]

Another indication of the economic vulnerability of lone mothers is the tendency for them to be removed from parishes in which they were resident but not settled, back to their place of legal settlement. While sojourners might be tolerated so long as they remained independent, and might even be relieved in a small way if they fell on hard times that were thought to be temporary, the needs of women with dependent children were such as to imply a long-term liability. They were just the type of families that were removed.[19]

The source of the vulnerability of widows, deserted wives and unmarried women to poverty is obvious. Women's earnings were much lower on average than were those of men. In this context, even single women often found it difficult to survive.[20] Moreover there is little evidence that women's wages increased in real terms over the course of industrialization and indeed many authors believe that outside fairly narrow geographical and industrial sectors their opportunities and earnings declined.[21] Charles Feinstein's recent new estimates of nominal and real earnings, which represent the first serious attempt to integrate trends in women's wages, reinforce the pessimist stance.[22]

The implications, in terms of the relative poverty of such families, are shown in Table 1. This table uses an original data set of household budgets collected as part of a larger project which details household composition, the earnings and occupations of family members and other sources of income, in kind and in cash, for the years 1787 to 1865.[23] These

TABLE 1
Economic well-being by family type, Great Britain, 1787–1865

	Family income (£)[a]	*Family size*	*Income per head* (£)[a]	*Income per adult equivalent*[b] (£)[a]	*Sample size*
(*a*) *Husband-and-wife households* (*by husband's occupation*)					
High-wage agriculture[c]					
1787–1815	23.06	6.6	3.62	6.28	15
1816–1820	41.21	6.5	6.42	10.89	38
1821–1840	36.22	6.3	6.34	10.42	30
1841–1845	50.64	7.0	7.23	12.98	1
1846–1865	41.43	5.3	8.63	13.45	28
Low-wage agriculture[c]					
1787–1815	23.68	5.9	4.22	7.01	126
1816–1820	n/a	n/a	n/a	n/a	n/a
1821–1840	32.18	5.6	6.25	10.03	151
1841–1845	32.12	7.1	4.99	8.55	11
1846–1865	38.02	6.0	7.24	11.58	99
Mining					
1787–1815	45.37	7.0	7.12	12.31	5
1816–1820	51.88	7.0	7.44	13.06	52
1821–1840	78.00	7.5	10.38	18.77	4
1841–1845	52.56	5.4	10.80	16.91	32
1846–1865	78.66	6.0	13.11	22.67	1
Outwork					
1787–1815	59.17	6.1	9.61	16.54	22
1816–1820	44.19	6.9	6.64	11.35	198
1821–1840	43.78	6.0	8.30	12.93	92
1841–1845	31.33	6.1	5.41	8.91	44
1846–1865	43.15	5.8	8.03	12.92	55
(*b*) *Female-headed households* (*all occupations*)					
1787–1815	37.75	6.4	6.03	11.30	14
1816–1820	26.88	4.3	5.98	10.08	59
1821–1840	28.16	5.1	6.02	10.31	22
1841–1845	18.95	3.3	7.87	11.49	4
1846–1865	21.45	4.0	5.24	9.10	2

[a] Nominal incomes, per annum.
[b] Husband and wife receive a weight of 1.75, children of all ages 0.43, all other adults (lodgers, apprentices, grandparents etc) 1.0.
[c] Agricultural cases are divided into high- and low-wage counties according to E. H. Hunt, 'Industrialization and regional inequality: wages in Britain, 1760–1914', *Journal of Economic History* **46** (December 1986), pp. 935–66.
Source: Household budget data set; see note 23 in this article.

are used to compare the living standards of female-headed households with those of other types of family. Table 1 compares total family incomes in households headed by men, in several occupations chosen to span a range of experience, with the incomes of female-headed households for several subperiods of the industrial revolution.[24] The table also shows mean household size, per capita family income and income per adult equivalent, in order to expose the relative standards of living which the different money amounts could deliver to family members.

In the first few decades of industrialization, female-headed households fared reasonably well compared with households headed by men in some occupations. Family incomes were below those of miners and the then prosperous outworkers, but they were significantly higher than those of agricultural labourers in both high- and low-wage counties. The predominance of non-agricultural occupations in the female-headed households, with the better employment opportunities implied, boosted their relative prosperity. Nor was family size or composition sufficiently different across families to distort conclusions based on the total income figures; in 'income per adult equivalent' terms female-headed households ranked above farm labourers' families but below those of industrial workers.

After the Napoleonic wars, the position of female-headed households deteriorated relatively. The deterioration was partially offset by a simultaneous relative decline in family size but even in adult-equivalent terms these families lost their advantage over farming households and eventually fell below the miserable condition of southern agricultural labourers. Although the incomes of outworker families faded too, in per capita and adult-equivalent terms, except in the dreadful slump of 1841–1845, even handloom weavers, framework knitters and other domestic industrial workers remained more prosperous than female-headed households. Indeed many of the female heads of families followed exactly these occupations, which contributed to their economic problems.

The numbers of families in the final two periods are small in the data in Table 1 and therefore sensitive to the experiences of particular cases which may not be representative. Can this thin evidence be supplemented by data from other sources? For the 1840s, Ashworth's data for the manufacturing population of Bolton provide additional evidence.[25] Earnings and other poor relief provided widows and deserted wives and their families with weekly incomes of about 6s 6d in the depth of the trade depression, a figure which is in line with the 7s 3d estimated for 1841–1845 for such families from the household budgets. Other checks also suggest that the estimates from the household budgets are reasonable. For example, in 1815 Mary Swinney, a widow with four children to maintain

and who sold butter and meat in the streets of London and went out washing and charring, was recorded as receiving a pension from her parish of St Martin, Vintry, of 8s per week.[26] By 1817 the oldest boy, then aged 17, was reported as employed and earning 8s a week at a local soap manufactory and the second boy was also employed and earning 1s per week plus his victuals. In 1817 Mrs Swinney had an illegitimate child who then died. Nonetheless the guardians agreed to continue the 8s per week to care for the younger two Swinney children, but in 1818 Mrs Swinney's allowance for her younger children was reduced to 5s per week. Assuming she could earn 3s per week from her hawking and cleaning, the Swinney family had 4s per week in adult equivalent terms in 1815, which compares with the 4s 4d per adult equivalent implied by the family budget data used in Table 1. However the Swinneys' situation was improved when the older boys obtained work. Assuming that they pooled all their income, and that Mrs Swinney did not earn any less from her economy of makeshift employment, even if the earners are now counted as adults, the family's adult equivalent income rose to 5s 2d. But in 1818 when her pension was cut back to 5s, and Mrs Swinney perhaps no longer shared her older sons' earnings, the weekly adult equivalent was back to 4s 4d, though the analogous figure from the household accounts (see Table 1) was now 3s 10d.

The household accounts data also highlight an important implication of the relative poverty of families headed by women: the importance of children's earnings to the welfare of their mothers and siblings and the relatively high participation rates of children in such families. Table 2 compares the earnings of children as a proportion of family income in households headed by men in the same variety of occupations with the relative earnings of children in the sample of female-headed households. As was to be expected, children's contributions made up a larger proportion of family incomes in the female-headed households. Mothers' earnings and poor relief were not sufficient to fill the gap created by the absence of a father's earnings. Only in outworker families were children contributing at something like the same relative level as in husband-and-wife households. Moreover children's contributions seem to have been sustained through the 1840s in these families and although there appears to be a falling-away at the middle of the century, the number of families that figure here is very small and the result may be unreliable.

The corollary of the relatively high rate of contribution is the relatively high participation rates of children in the labour force in the female-headed households. Children's participation rates are seen to be higher, and usually much higher, than in families with fathers present whatever the father's occupation was. In these female-headed houses, where there

TABLE 2
Contributions of children to family income and labour-force participation of children by family type, Great Britain, 1787–1872[a]

	Children's contribution (%)	*Children's participation rate (%)*	*Participation rate of children aged 5–9 (%)*
(*a*) *Husband-and-wife households* (*by husband's occupation*)			
High-wage agriculture			
1787–1816	8.3 (53)	17.1 (280)	8.1 (86)
1817–1839	20.1 (11)	32.7 (52)	15.4 (13)
1840–1872	4.2 (24)	4.3 (93)	0.0 (44)
Low-wage agriculture			
1787–1816	8.7 (97)	16.3 (375)	12.1 (124)
1817–1839	4.6 (68)	12.0 (209)	6.9 (58)
1840–1872	3.6 (42)	5.8 (172)	1.2 (86)
Mining			
1787–1816	29.4 (37)	32.0 (228)	4.6 (65)
1817–1839	23.9 (12)	29.6 (54)	5.9 (17)
1840–1872	12.5 (31)	22.6 (124)	9.1 (22)
Outwork			
1787–1816	32.8 (76)	37.4 (521)	11.3 (151)
1817–1839	27.5 (168)	26.0 (941)	10.4 (231)
1840–1872	20.6 (65)	28.6 (294)	5.7 (70)
(*b*) *Female-headed households* (*all occupations*)			
1787–1815	44.9 (15)	43.2 (88)	—
1816–1820	46.8 (54)	46.2 (184)	—
1821–1840	32.7 (22)	42.4 (92)	—
1841–1845	25.0 (4)	44.4 (9)	—
1846–1865	9.1 (2)	33.3 (6)	—
1787–1865	41.6 (97)	44.7 (379)	17.6 (74)

[a] Sample size in parentheses; dashes indicate that figures are not available.
Source: Household budget data set; see note 23.

are more observations than for contributions, the mid-century decline appears less marked, reinforcing the conclusion that, despite the growth of protective labour legislation, children's contributions to female-headed families remained important well into the nineteenth century. Thus an independent inquiry found that even later in the century, when schooling had become compulsory, children under 16 contributed 50 per cent of the incomes of female-headed households on poor relief.[27]

Not only did the economic pressures on these families push a higher proportion of their children into the labour force, but market (paid) work occurred at earlier ages. It was very unusual for children younger than five

years old to be employed. Generally children started work at around ten or eleven years old though they might begin at a younger age in the factory districts.[28] Outside these areas, working at ages below nine was unusual in families headed by men. In contrast, almost a fifth of children aged five to nine in families headed by women were in the labour force.

Early working was the norm for children in households without a father's earnings, in fact it was a defining characteristic of their situation. It was widely recognized as the major difference between themselves and more fortunate children by fatherless autobiographers of the period.[29] Checks using other biographical evidence confirm that fatherless children started work two or three years before those with fathers present in their families.[30] Members of the well-known Royal Commissions which investigated children's conditions of work also frequently associated children's employment (and their employment at young ages and in arduous jobs), with family circumstances which denied them a father's support.[31]

The same sources also link the employment of children to their subsequent ill-health and poor physical development. A large amount of anecdotal evidence relating to individuals implicates early working and the childhood deprivation associated with an absent father as causes of ill-health and frailty. The case of little Elizabeth Hudson provides an example that pulls together many of our themes.[32] Elizabeth was orphaned by the death of her mother at Avening near Gloucester in 1802. Her father, as Hampson says 'like so many fathers of the period', was missing. The legal settlement of the child was at Royston in Hertfordshire, but the overseers of Avening wrote to Royston to request non-resident relief so that Elizabeth would not have to be removed. They quoted her dying mother's urgent request that the child, whom she had struggled for years to support independently, should not be sent away from the only friends she had ever known. The costs of life on permanent probation, under the threat of removal, and with only a mother as a breadwinner, are reflected in the death of Mrs Hudson and the perilous health of Elizabeth. 'The child', said the overseer, 'has been very poorly this Winter. I am afraid she will be but of a weak Constitution, having suffered considerably from want while her mother lived, she being often so ill and never would apply to you for help, having always such a fear of being brot away from her native place to Royston' (that is, removed to their place of legal settlement). Despite her frailty, little Elizabeth had to contribute what she could to her keep: 'We have put the child to weaving, but are obliged to deal gently with her on account of her feeble frame and very slender make.'

As we see, then, the pressures on fatherless children to work, and to

work at an early age, were institutionalized within the operation of the Poor Law and probably intensified with the transition from the Old to the New Poor Law. Poor relief was refused to families with children of an age at which the guardians considered them employable if they were not working.[33] Workhouse children were employed at young ages, setting the standard; nine was not an uncommon age to begin an 'apprenticeship', and although some dramatic cases of abuse were probably not typical, the norm was likely to have been severe employment and material and emotional deprivation.[34] After 1834 outdoor relief for widows was conditional on their children's inability to earn their own livelihood and was established in law. Remember that the 1844 General Order on the Prohibition of Outdoor Relief exempted widows only on condition that they had legitimate children dependent upon them 'and incapable of earning his, her, or their livelihood'.[35]

Not only were the children in households without male heads likely to be out at work (and at early ages), but their mothers were also more likely than married women to be employed. An analysis of participation rates of female heads of households suggests that more than 75 per cent of such women contributed income to their families compared with about half of married women with husbands present. The different levels of participation discerned are close to those found by Peter Earle in his investigation of women's work using court depositions for the late seventeenth and early eighteenth centuries.[36] The demands that employment imposed on the time and energy of lone mothers and their likely enforced absence from home had implications for the well-being of their children that go beyond their relative poverty. It is to these influences and the net effects of poverty, deprivation and early and arduous employment on children's welfare that we now turn.

III

In families headed by women, not only were incomes low, implying deprivation in terms of poor food and bad housing, but time was also in short supply. Mothers who worked had neither time nor energy to eke the maximum comfort from whatever commodities their meagre wages had purchased. They probably resorted to store-bought food requiring little preparation, with possible nutritional disadvantages to their children. They had both less time and less money to spend on keeping the house, clothes and the children themselves warm and clean. In this section we use information on expenditures in female-headed households from the data set of household budgets we have used earlier, along with other evidence, to investigate this web of deprivation.

The nutritional status of labouring families, like many early industrial miseries, was linked by social commentators not only to poverty but to the way the poor chose to spend what little they had. Thus Eden, for example, in condemning the diets of the labouring poor concluded 'that the miseries of the labouring poor arose, less from the scantiness of their income than from their own improvidence and unthriftiness',[37] He deplored southern agricultural labourers' use of luxuries, in which category he placed tea, sugar and wheaten bread and butter. He bemoaned their rejection of cheap but nutritious northern dishes such as 'hasty pudding' (milk porridge). While Eden's diatribe against the spending patterns of the poor was insensitive to the constraints families faced when local conditions, and in particular the scarcity of common resources, affected access to key products, recent analysis has confirmed the superior nutritional content of the northern diet, which was some 23 per cent higher in calories than that of the south. But although this northern diet would provide just enough energy for today's active males, it was not adequate to support the heavy work of early-nineteenth-century agricultural labourers.[38] The southern diet implied a grave calorific deficit. If inadequate nutrition characterized families with fathers present, how much worse was the situation in female-headed households with their reduced budgets and working mothers?

The household budgets in our data set afford only limited opportunities to investigate food expenditures in female-headed households as relevant expenditures were recorded for only 15 such households. These were compared with the expenditures in man-and-wife households.[39] In some cases, where households had the same geographical location, occupation of household head, year, and original source, and differed only in the presence or absence of a male head, adult-equivalent expenditures on foodstuffs were computed and compared. In other cases, where households were dissimilar in terms of location, occupation and year, regression analysis on the sample of man-and-wife households was used to estimate the relationship between these characteristics of families and food expenditures. The regression coefficients obtained were used to predict expenditures in the female-headed households given their income, family size, location, household head's occupation and year, and the predicted expenditures were then compared with the actual amounts spent on food.[40] Table 3 compares the food expenditures of the 15 female-headed households in the survey with those of some 173 husband-and-wife households.

Despite the small numbers involved, the results are strikingly consistent across subgroups. As expected, female-headed households usually showed lower expenditure on food than the equivalent husband-and-wife households, evidence of the privation suffered when fathers were absent.

TABLE 3
Comparison of expenditure in female-headed and husband-and-wife households

Sample:	8 women cf. 149 families (regression)	4 women cf. 6 families (adult eq.)	1 woman cf. 1 family (adult eq.)	2 women cf. 17 families (adult eq.)
Year:	1787–1796	1839	1843	1844
Male occupations:	Various	Various	Agriculture	Framework knitter
Region:	Various	London	Wiltshire/ Suffolk	Leicester
Sources (see sources note below):	Eden & Davies	Bosanquet	PP 1843	PP 1845
Adult equivalent income (£ p.a.)[a]:				
Female-headed household	6.58	9.64[b]	14.43	4.26
Husband-and-wife household	7.26	17.67	8.52	7.42
Average number in household:				
Female-headed household	6.8	5.0	2	4.3
Husband-and-wife household	6.2	5.5	7	5.3
% difference in adult equivalent income:	−9	−45	+69	−43
% difference in expenditure (as % equivalent man-and-wife household expenditure)[c]:				
Starch	−24	+25[d]	−47	−11
Protein	−43	−63	—[f]	−18
Beverages	−30	−36	+163	+24
Sweeteners	+26	−33	+86	+20
Dairy	+356	−38	+13	+257
Other food	+29	−99	—	—
Total food	−23	−24	−37	−6
Expenditure on soap (£ p.a.):				
Female-headed household	0.68[e]	0.34[g]	0.99[e]	0.49
Husband-and-wife household	1.52[e]	1.56	1.46[e]	0.58
Expenditure on coal (£ p.a.):				
Female-headed household	2.60[g,h]	2.47[g]	—	2.16
Husband-and-wife household	1.38	3.85	1.98	2.21

For Table notes see opposite.

The composition of the expenditure was also different. Deprivation manifested itself in reduced expenditure on bread, potatoes, meat and bacon, and an increased expenditure on tea, coffee, sugar and treacle and some dairy products. The only exceptions were Bosanquet's London widows (see Table 3 source note) who increased bread consumption at the expense of other items. But their expenditure patterns reflected the parish provision of bread as relief-in-kind, which altered expenditure patterns. Even so the decrease in tea, sugar and butter consumption was small relative to the decrease in expenditure on meat. These budgets illustrate the importance of relief-in-kind in effectively targeting welfare to sustain basic maintenance. The evidence indicates that female-headed households, as well as buying less food, also shifted expenditure away from basic foodstuffs. Both the quantity and the composition of the food bought were detrimental to children's well-being.

Why did these differences in diet occur? Two explanations present themselves: first, that female-headed households exhibited gendered preferences for certain foods summarized as 'the female diet'; and second, that constraints on time and energy in female-headed households affected the type of food consumed in them. Early-nineteenth-century social commentators often observed gender differences in diets, with men enjoying the lion's share of the nutritious food. Cultural norms were both reflected and reproduced in different standards for men and women in, for

[a] Calculated using an adult-equivalent scale of man = 1, woman = 0.7, child = 0.5.
[b] Some self-provisioned potatoes and flour not included here.
[c]
Starch	bread, flour, potatoes, oatmeal
Protein	bacon, meat, eggs, lard, fish
Beverages	tea, coffee
Sweeteners	sugar, treacle
Dairy	milk, cheese, butter
Other food	vegetables, ale, salt.

[d] The parish provided considerable amounts of bread to these female-headed households. The value of this has been included in the starch expenditure.
[e] Expenditure on both soap and candles, as these were not itemized separately in the budgets.
[f] Dashes indicate no expenditure on these items in at least one of the types of household.
[g] Some of these women took in washing – including one who recorded no expenditure on soap.
[h] Only one observation here, taken from Eden's budgets; estimates only were given in Davies's budgets for fuel expenditure (see sources note below).

Sources: Household budget data set; see note 23. Also Sir Frederic Morton Eden (ed. A. G. L. Rogers), *The state of the poor: a history of the labouring classes in England, with parochial reports* (London, 1928); David Davies, *The case of labourers in husbandry* (London, 1795); and S. R. Bosanquet, *The rights of the poor and Christian alms giving vindicated* (London(?), 1841). PP 1843 = Parliamentary Papers, 1843, XIV: *Reports of Special Assistant of Poor Law commissioners on the employment of women and children in agriculture*; PP 1845 = Parliamentary Papers, 1845, XV: *Report of the Commissioner employed to inquire into the condition of the framework knitters, with appendices.*

example, workhouse dietaries. In a Rutland workhouse the women had tea, bread and butter for breakfast while the men had milk or broth. Men generally received most of the dairy products, while women and children only had small amounts of milk added to tea and porridge.[41] In the mid-nineteenth century, Dr Edward Smith's investigation of working-class diets revealed the same pattern: men had meat, while women and children existed on bread, potatoes and weak tea. Smith commented, 'this is not only acquiesced in by the wife, but felt by her to be right, and even necessary for the maintenance of the family'.[42] In other words, these gendered standards were rationalized and legitimated by a vision of men as the breadwinners and wives and children as dependants. But when a woman, possibly with some assistance from her older children, became a family's main breadwinner, why did this pattern persist? Surely then there was need for the woman to have as much nutritious and sustaining food as possible. Why did women who headed households continue to consume a diet that lacked nutrition and involved relatively expensive luxury commodities?

Seemingly irrational dietary choices by women have been observed in other studies.[43] The food purchased by single female factory operatives during the Lancashire cotton famine conformed to 'the female diet'. In adjusting their normal fare to their out-of-work circumstances, these women reduced their consumption of bread, potatoes and meat markedly, while that of sugar, tea and butter was more nearly maintained. Reluctance to abandon sweet tea in straitened circumstances led to a diet which allegedly resulted in one poor girl dying of scurvy, a disease almost exclusively found among women during the cotton famine.

What factors explain women's apparent preferences for sweeteners and beverages, preferences which seem to have persisted even as falling incomes forced total expenditures down, leaving diets dangerously unbalanced? Perhaps the addictive nature of caffeine or the rush of energy afforded by sugar may have been important.[44] But why were women more susceptible to this addiction? Perhaps tea and sugar became a relatively cheap way of providing calories and warmth in that they acted as appetite-suppressants and so enabled other food expenditure to be reduced.[45] There may have been a psychological element in the choice. The small amounts of meat that were affordable could only be made into unpalatable messes, such as the infamous Count Rumford's soup, avoided as being reminiscent of the workhouse. The monotony of bread and tea was preferred.[46] But the palatability of a diet centred around bread was also crucial. When diets were such that meat, cheese and butter were rarely eaten, tea became a necessity, as it gave a cold meal some resemblance to a hot one.[47]

TABLE 4

Calorific content of food in nine late-eighteenth-century female-headed households[a]

	Calories per penny (d)[b]	*Expenditure on item (d per week)*								
		Widow[c]	*Woman + 6 children*[c]	*Woman + 6 children*[d]	*Woman + 6 children*[d]	*Woman + 4 children (1 adult)*[d]	*Woman + 6 children*[d]	*Woman + 6 children*[d]	*Woman + 6 children*[d]	*Woman + 6 children*[d]
Wheaten bread	384	0.6	104[f]	68.5[f]	87.5[f]	79[f]	48	36[f]	60[f]	1
Oatmeal	880	6.1	—	—	—	—	—	4	—	50
Potatoes	1,000	0.4[e]	9	—	—	—	—	4	—	5
Meat	192	0.3	—	16	12	4	—	8	14	—
Cheese	320	—	7.5	—	—	—	8	5	—	—
Milk	448	2.5	—	—	—	3[g]	—	14	—	6
Butter	320	1.2	20	4	4[g]	—	—	3[g]	2[g]	16
Beer	200	—	—	—	—	—	—	—	12	—
Sugar	192	0.9	—	4	4[g]	3[g]	—	3[g]	2.5[g]	—
Tea	0	—	6	4	4[g]	—	3	3[g]	—	—
Calories per adult equivalent per day[h]										
Minimum		1,100	2,199	1,197	1,446	1,573	780	1,230	1,114	2,514
Maximum[i]		1,100	3,048	1,639	2,163	2,382	780	1,525	1,606	2,514

[a] Dashes indicate no expenditure in that category.

[b] Taken from C. Shammas, 'The eighteenth-century English diet and economic change', *Explorations in Economic History* **21** (1984), 258.

[c] From Eden (see sources note below). [d] From Davies (see sources note below).

[e] Grows three pecks of potatoes a year, priced at 0.4d per lb. [f] Expenditure on wheat, salt and yeast added together.

[g] Expenditure for a number of items was given together so was divided approximately equally among the items.

[h] Adult equivalents calculated as 0.75 woman or child > 16, 0.5 child < 16.

[i] For the Eden budget with a woman and six children the 104d expenditure relates to flour, yeast and salt; however, this expenditure rises to 13s and 14s per week when they buy bread. Thus the ratio 1.56 is used to calculate calorific intake when wheat flour is converted into bread at the stated number of calories per penny, giving the maximum estimate of calories available per adult equivalent per day.

Source: As in Tables 1 and 3 (source notes).

Time constraints also dictated the choice of food. A store-bought diet was likely to be adopted when women worked. Indeed, de Vries has argued that the increase in women's and children's waged work raised incomes and enabled desires for market-produced goods to be realized. At the same time increased labour-market work crowded out home-based production, with further feedback effects expanding market demands.[48] The increase in women's paid work has been shown to have reduced the amount of home-baking and brewing undertaken in the late eighteenth century and in urban areas in the nineteenth century.[49] In towns, women's work meant that people wanted food that needed little preparation and was tasty and preferably hot. They bought bread, ready-cooked potatoes and bacon if it could be afforded. Tea was also considered essential. Women's paid work was associated with lack of domestic comfort and poor-quality but expensive food.[50] How much more evident these pressures affecting diet must have been where the mother was the breadwinner and only able to earn the meanest wages. Time and income constraints, combined with the influence of tastes, meant that the limited budget for food in female-headed households emphasised so-called luxury items to the neglect of basics. What did this imply for nutrition in these households?

The calorific content of the food consumed can be calculated for the late-eighteenth-century households in Table 3 (1787–1796) (see Table 4).[51] The calories available to an adult equivalent (male) in these female-headed households varied from 780 to 3,048 per day.[52] The average calories purchased per adult equivalent per day ranged between 1,461 and 1,862 calories. Actual consumption for a woman was three-quarters of this, and for a child one-half. An active male today requires 2,700 calories, a female 2,000, manual labourers 3,500 or more, and children from the age of ten greater amounts than adults in order to grow.[53] The amount of nutrition available in these households was woefully deficient. The average calories available for mothers in the female-headed households in our sample made up less than two-thirds of the minimum calorie requirement for women. Nutritional deprivation in the female-headed household was extreme.[54] The story remains as distressing for the nineteenth-century households. The surveys of Dr Smith provide us with the dietaries of single women in the cotton famine of 1862, and of needlewomen's families in 1863.[55] These make possible comparisons with the amounts of food available in our female-headed households (see Table 5). Our women ate less bread and grain, less meat, less butter and less tea and sugar than the unemployed factory operatives and needlewomen. There was higher consumption of potatoes and milk, which may have compensated for some deficiencies in other areas. But in

TABLE 5

Quantity of food available per adult equivalent per week in nineteenth-century surveys and in female-headed households (lbs/pints)

Food type:	*Bread*	*Barley*	*Oatmeal*	*Potatoes*	*Meat*	*Milk*	*Butter*	*Cheese*	*Sugar*	*Tea*
Single women (per woman), 1862[a]	8.2	—	1.6	2.3	0.2	0.8	0.4	—	0.9	—
Needlewomen (per adult equivalent), 1863[b]	7.75	—	—	2.50	1.02	0.35	0.28	—	0.45	0.04
Household budgets:										
Eden 1795[c]										
Widow	0.3	2.6	1.6	0.9	0.1	8.5	0.2	—	0.5	—
Woman + 6 children	—[g]	11.2	—	7.4	—	—	0.5	0.3	—	0.03
Bosanquet 1839[d]										
Woman + 4 children[e]	4.67	—	—	8.76	0.55	—	0.24	0.05	0.64	0.05
Woman + 4 children	9.50	—	—	20.08	3.64	—	0.71	0.11	0.74	0.05
Woman + 4 children	7.58	—	—	3.13	0.15	—	0.06	—	0.18	0.01
Woman + 3 children[f]	10.70	—	—	—	—	—	—	—	—	0.04
PP 1843 (Women and children in agriculture)										
Woman + 1 child	9.3	2.9	—	self	—	—	0.25	—	0.25	0.06
PP 1844 (Framework knitters)[d]										
Woman + 3 children	4.27	—	—	—	0.36	1.56	—	—	0.30	0.01
Woman + 4 children	10.91	—	—	7.52	0.87	0.73	—	—	0.24	0.02
Averages:										
1862/1863	8.0	—	0.8	2.4	0.6	0.6	0.3	—	0.7	0.02
Female-headed households:										
Per adult equivalent	6.4	1.9	0.2	6.0	0.6	1.2	0.2	0.1	0.3	0.03
Per woman	4.8	1.4	0.2	4.5	0.5	0.9	0.2	0.1	0.2	0.02

For table notes, see overleaf.

Notes to Table 5:

[a] Seven single women's diets during the winter of 1862, from Dr Smith's report, as calculated in D. J. Oddy, 'Urban famine in nineteenth-century Britain: the effect of the Lancashire cotton famine on working-class diet and health', *Economic History Review* **XXXVI** (1983).

[b] Thirty-one needlewomen's families (average household size 1.6; adult equivalent 1.2) surveyed by Dr Smith in 1863 as calculated in J. Burnett, *Plenty and want: a social history of food in England from 1815 to the present day* (3rd edn, London, 1989), 171.

[c] Some quantities have been calculated using the price of bread in London, from B. R. Mitchell, *British historical statistics* (Cambridge, 1988), 770, and prices for 1795 from R. K. Fleischman, *Conditions of life among the cotton workers of south eastern Lancashire during the industrial revolution*, *1780–1850* (New York, 1985), 96–139.

[d] Where quantities were not available they were calculated using the following prices per lb: potatoes 0.29d; bread 10d per 4lb loaf; sugar 6d; tea 6s 8d; butter 9d; cheese 8d; flour 2d; milk 1d per pint. Prices are based on information in Mitchell, *British historical studies*, 770, and Fleischman, *Conditions of Life*, 96–139.

[e] Also has 3/4d beer and 2d fish a week.

[f] Also has 1 1/2d dripping per week.

[g] Dashes indicate that no food of this type was recorded as having been bought.

Sources: Household budgets as listed in Table 3 source note, as well as sources listed in the notes above.

many major categories these households ate considerably less than the women on famine diets identified by Smith. The parlous condition of the lone mother and her offspring is again evident.

The cost of fuel also determined what was eaten. Eden identified scarcity of fuel as an important factor causing the poor diet found in the south of England. High fuel costs meant that ready-baked bread was bought and Sunday meat was cooked in the baker's oven, and it curtailed the use of the more nutritious menus found in the north, which required lengthy cooking.[56] Similarly the reduced consumption of meat and potatoes observed during the cotton famine has been related to the additional expenditure on fuel that making a meal out of these items would have required.[57] The cost of fuel caused a move away from more nutritious home-cooked foods to bread and treacle, with porridge and tea as the only hot foods available. But, in addition to the consequences for diet, economizing on fuel had other implications for the health and welfare of the poor family, particularly when the mother worked. Insufficient fuel affected the comfort of the home and the standards of personal cleanliness practised in it, and has been cited as a cause of regional differences in labourers' health:

> cheap fuel in the North was partly responsible for the better health observed among the agricultural labourers there. It not only promoted cleanliness, but it made possible warm houses, hot food and dry clothing, which could also be more frequently and easily washed. In the South where scarcity of fuel often caused the fire to be extinguished between meals, and a change of clothes was out of the question, clothes had often to remain wet until they were put on again the next day.[58]

Tight budgetary constraints and limited time spent at home must have been conducive to making savings on fuel in the households of widows and deserted mothers. Female-headed households spent up to one-third less on coal and considerably less on soap than husband-and-wife households (see Table 3). These economies occurred despite similar family sizes in the two types of household and even in those cases where lone mothers were earning money by taking in washing – indeed, one woman seemed to ply this trade without the aid of cleaning agents. These expenditure patterns and lone mothers' greater commitment to market work boded ill for the comfort and cleanliness of their homes and children. Other sources bear on the same issues. An investigation into the state of the poorer classes in St George's in the East, a London parish, in 1848, which surveyed some 1,651 married couples and widowers with children and 151 widows with children, as well as a number of single men and women, recorded (among other things) the sufficiency and cleanliness of clothing and the quality of furnishing.[59] Of families headed by widows 64 per cent were reported as having insufficient clothing as compared with 44.6 per cent of families headed by men. Similarly 13.4 per cent of widows' families had dirty clothing compared with 10.8 per cent of married couples and widowers with children. Rooms were badly furnished in 27.9 per cent of homes of widows with children but in only 15.4 per cent of homes with male heads.

Did female-headed households live in more overcrowded conditions and in less pleasant locations to economize on rent? Some evidence for this can be found in the household budgets data. A regression was run to calculate the determinants of rent paid in husband-and-wife households. The resulting coefficients were used to predict rents for female-headed households and these were compared with the actual rents paid.[60] In seven cases the rents paid were lower than predicted (average £3.10 p.a. compared with £4.89). In a further four cases the rent paid was 6 per cent higher than predicted, but for the remaining two households the rent was nearly double the predicted rent, and both these households were in arrears.[61] It might be that the need to live near job opportunities and the size and sex composition of families limited the extent to which female-headed households could economize on rents. The investigation of conditions in St George's discussed above also looked at expenditures on rent and reported similar absolute amounts spent by female-headed families with children and families with male heads, although of course this meant that rents absorbed a much higher share of family budgets in the former cases.[62]

Children's poor health and especially their shorter stature have been linked to the use of narcotic drugs, links which the pioneers of

anthropometric analysis were reluctant to rule out.[63] The main cause of poisoning was the use of opiates and laudanum by either childminders or mothers allegedly to keep children quiet while they were out at work in factories or trying to work at home. Engels, among others, portrays this practice as being one of the deleterious effects of women working: 'One of the most injurious of these patent medicines is a drink prepared with opiates, chiefly laudanum, under the name Godfrey's cordial. Women who work at home, and have their own and other people's children to take care of, give them this drink to keep them quiet, and, as many believe, to strengthen them', a practice which is now thought to have enfeebled the child and may even have lead to death in some cases.[64]

The use of opiates to lull restive infants was not confined to factory districts but was also widespread in agricultural regions and areas with domestic industry.[65] Pressures to resort to such desperate remedies must have been stronger where the woman was the sole supporter of her children and required to go out to work or do long hours at outworking trades. Furthermore, opium was thought to be a remedy for the ubiquitous gastro-intestinal complaints associated with poor housing, bad sanitation and inadequate food: conditions which female headship exacerbated.[66] The account of Mary Cotton, a twenty-year-old lace-runner in Nottingham, who eventually overdosed her illegitimate child, shows how the pressures on lone mothers combined with their ignorance to encourage the use of opiates: 'She could not afford to pay for the nursing of her child, and so gave it Godfrey's to keep it quiet, that she might not be interrupted at the lace place; she gradually increased the quantity by a drop or two at a time until it reached a teaspoonful; when the infant was four months old it was so "wankle" and thin that folks persuaded her to give it laudanum to bring it on, as it did other children.'[67]

IV

If lone women found it difficult to provide their children with adequate nutrition, this should have left an imprint on 'output measures' such as height. The heights of children with different family backgrounds were investigated in an analysis of the Marine Society data collected by Floud, Wachter and Gregory.[68] Evidence already exists of the importance of relative deprivation in explaining heights within this sample. For example, John Komlos in his analysis of trends in stature noted the stunting of boys presented to the Society by a poor relative, suggesting a background of privation.[69] Other data have suggested the deleterious effects of early and

arduous employment on the heights of children.[70] We will develop these observations in this section.

The Marine Society was established in 1756 with the dual objectives of supplying the navy with recruits and providing employment for poor boys in London who would not otherwise find work. However, the Society was constrained in who it could help by the demands of the navy: boys must not have handicaps or debilitating diseases and were supposed to meet a height requirement. Even so the bodies of recruits to the Marine Society in the eighteenth century showed signs of extreme deprivation. On average, these 11- to 19-year-olds were very short compared with both contemporary upper-class recruits at Sandhurst and modern populations: a mere 50.9 inches for those aged 13 born between 1753 and 1780, a full 10 inches less than the London boys examined in the 1960s.[71] Here we use a subset of 7,180 observations of the original Marine Society data set in which details of the boys' socio-economic status as well as their heights are available and we make cross-sectional comparisons to see if paternal absence is evident in height.[72]

What is there in the data set to inform us about the family circumstances of these boys? Recruiting officers did not record directly whether boys came from female-headed households or not. They did, however, have a column in the admissions registers in which the parish from which the boy came and his claim on that parish were recorded. In practice this column was used to record the name and address of the next-of-kin or, in cases where there was no relative, whether the boy was destitute or from a workhouse. In later years (from 1846 onwards), the heading of this column was changed to 'Parents, friends, etc.' but the same information was collected, thus making explicit the purpose of identifying the boy's nearest relative.[73] For many boys it was their father's name, address and occupation that were given, for others it was the mother. Smaller numbers of boys gave some other relative – a grandfather, father-in-law/stepfather, sister or aunt – and their name, location and business. In a quarter of cases the recruit's nearest relative was his mother. This is higher than the 9 per cent of lone mothers in the population cited earlier but in line with the percentage found among subsamples of the poor (see above), a status certainly pertaining to the Marine Society boys. A slightly higher proportion of boys gave their mother as their nearest relative during the later years and in the immediate aftermath of the Napoleonic wars, but overall the proportion showed considerable stability throughout the period for which there is data, 1770–1861 (see Table 6).[74] The proportion who had fathers increased from one-quarter of the intake to nearly two-thirds, with the consequence that the Marine Society reduced the percentage of destitute boys that it accepted.[75]

TABLE 6
Information on boys received into the Marine Society, 1770–1861

	Date received by the Marine Society												
	1770–1775	*1780–1783*	*1792–1793*	*1800–1804*	*1811–1813*	*1816–1817*	*1818–1820*	*1821–1823*	*1824–1827*	*1828–1831*	*1838–1839*	*1842–1847*	*1860–1861*
Height standard	51″	51″	52″	54/52″	50/51″	54″	55″	56″	57″	57″	57″	57″	57″
Sample size	502	628	185	680	314	319	505	447	986	605	540	1,014	455
% whose nearest relative was:													
Unknown	11	2	4	3	5	1	1	0	1	1	2	2	0
Father	27	39	34	42	49	44	48	47	49	58	57	53	62
Mother	20	25	17	30	27	28	25	27	26	23	26	25	23
Other relative	24	9	17	17	14	17	14	19	18	12	12	15	10
None (boy destitute)	17	25	28	8	6	10	11	7	6	6	2	6	5
% boys working by whom brought to the Society:													
Father													
Working	88	82	92	80	68	85	74	92	95	88	91	96	99
Unknown	6	0	5	3	12	7	19	3	3	4	6	3	0
Not working/ill	7	18	3	16	20	8	7	5	3	8	3	1	0
Mother													
Working	79	82	100	84	49	83	70	91	93	89	89	96	95
Unknown	13	—[a]	—	4	17	8	18	3	2	3	4	2	2
Not working/ill	8	18	—	12	35	9	12	6	5	8	7	2	3
Work status of mothers who brought boys to the Society (%):													
Working	29	79	91	19	2	3	2	34	83	74	71	68	95
Unknown	69	16	9	77	98	94	96	65	16	22	27	27	4
Not working/ill	2	5	—	3	—	2	2	1	1	4	1	5	1
Average age of boy by nearest relative (years):													
Father	14.1	14.0	14.9	14.3	13.5	15.0	14.5	14.8	15.2	15.1	15.3	15.3	15.0
Mother	14.1	13.9	14.8	14.2	13.3	15.0	14.6	14.8	15.1	15.2	15.4	15.4	14.9
Average height of boy by nearest relative (inches):													
Father	54.6	54.3	56.3	54.6	52.3	57.1	57.0	58.3	59.4	59.2	59.7	59.8	58.8
Mother	54.4	53.7	56.5	54.0	51.3	56.8	56.8	58.7	59.5	59.6	59.8	60.0	58.6

[a] Dashes indicate no observations are available. *Source:* Heights data set, ESRC 2134 (see note 72).

While we can be confident that the recruiting officer was recording the next-of-kin in the admission ledgers, further evidence can be cited in support of this conclusion. Firstly, boys whose mothers brought them to the Society were slightly more likely to have been working beforehand than those who had fathers entered in the books until 1804. It has already been demonstrated that early working was associated with fatherlessness. The difference disappears as the records move further into the nineteenth century because the average age of the boys accepted increased and with it the probability that all the boys would previously have had an occupation. Secondly, we can investigate whether lone mothers were more likely to be working than women in the population as a whole. Certainly it would seem unlikely that the officer would record the mother's occupation unless she were the person responsible for supporting the boy. Unfortunately there are some periods in which there are large numbers of non-recordings for the mother's occupation, but in many years very high proportions of mothers were observed to be working and throughout very few of these women are recorded as not working (see Table 6). The figures compare with the approximately two-thirds of married women found working during the Napoleonic wars, reducing to less than a half subsequently.[76] The high labour-force participation rates of mothers of Marine Society boys indicate that these mothers were trying to support children on their own.

Of course it is impossible to know how long a boy who named his mother as his nearest relative had been fatherless, but the care taken to record accurately categories such as father-in-law and grandfather means those who had a father recorded must have had a father at least until they joined the Marine Society. For fatherless boys the length of time for which their households had been without a male head is indeterminate; it may have been a recent desertion or bereavement for some, illegitimacy and lifelong fatherlessness for others. Thus the distinction to be drawn here is between those boys who had always had a father and those who gave their mother as next-of-kin, indicating that they were currently (and may have spent some time in) a fatherless state.[77] Despite the constraint that we can look only at a cross-section of boys at a point in their life cycles and so cannot comment on the cumulative effect of time spent without a father, valid comparisons can be made between these two groups. The implication is that any difference in height is likely to be a lower-bound estimate of the effect on stature of being without a father for any significant period during childhood.

There are strong a priori reasons to think that children from female-headed households suffered nutritional deprivation. If we do find that even in a group of highly disadvantaged recruits those who gave their

mother as their nearest relative were shorter than the rest, we can regard this as evidence of the unfortunate fate of children growing up without a father's earning potential.

The Marine Society (as well as many other institutions, such as the army and navy) imposed a minimum height standard. Age was less of a consideration. Taller entrants were viewed as being stronger and so more able to withstand the rigours of physical work. The minimum height varied from period to period as the Society tried to match supply to demand for naval recruits, resulting in shifting left-hand truncation in the distributions. The minimum height requirement was only 51″ in 1770 but it rose to 57″ by 1824 and remained at this level subsequently.[78] The initial analysis is conducted for subperiods over which the height standard remained unchanged. As the height standard increased so did the average age of the boys accepted into the Society but there were no overall differences in average age between those with and without fathers in each period.[79] Even so there is an indication that fatherless boys were shorter than their parented counterparts, a relationship which is evident until 1820 but breaks down as the height standard approaches 57″. The truncation has implications for what we know about heights of boys from female-headed households. Smaller boys found it difficult to enter the Society, so boys without fathers, if shorter, would have had a smaller chance of being recruited. Therefore those that we observe in the sample will be from the more fortunate backgrounds within this disadvantaged group.

Cumulative percentage frequency diagrams of heights confirm the shorter stature of fatherless boys (see Figure 1).[80] In general, boys aged 13 or 14 tended to be shorter if they were fatherless, but the difference was no longer apparent for 15- and 16-year-olds. Two features are evident. First, as the heights standard increased the Society took fewer boys from the younger age groups, and if the relationship between fatherlessness and height only existed for boys in their early teenage years then it would be artificially removed as the data move further into the nineteenth century. Second, large proportions of boys at younger ages were accepted below the height standard. For instance, in 1770–1783 around one-third of the 13-year-old recruits were below the 51″ height standard and in 1811–1813 around a half were below it. Significant proportions of 14- and 15-year-olds were also accepted below the 57″ height standard in later years. A higher proportion of fatherless boys were accepted below the height standard, which may be related to their fatherless state. Recruiting officers were susceptible to special pleading and these boys would have been more in need of the Marine Society's aid than those with fathers, so the rules are likely to have been applied more flexibly to fatherless boys. That some

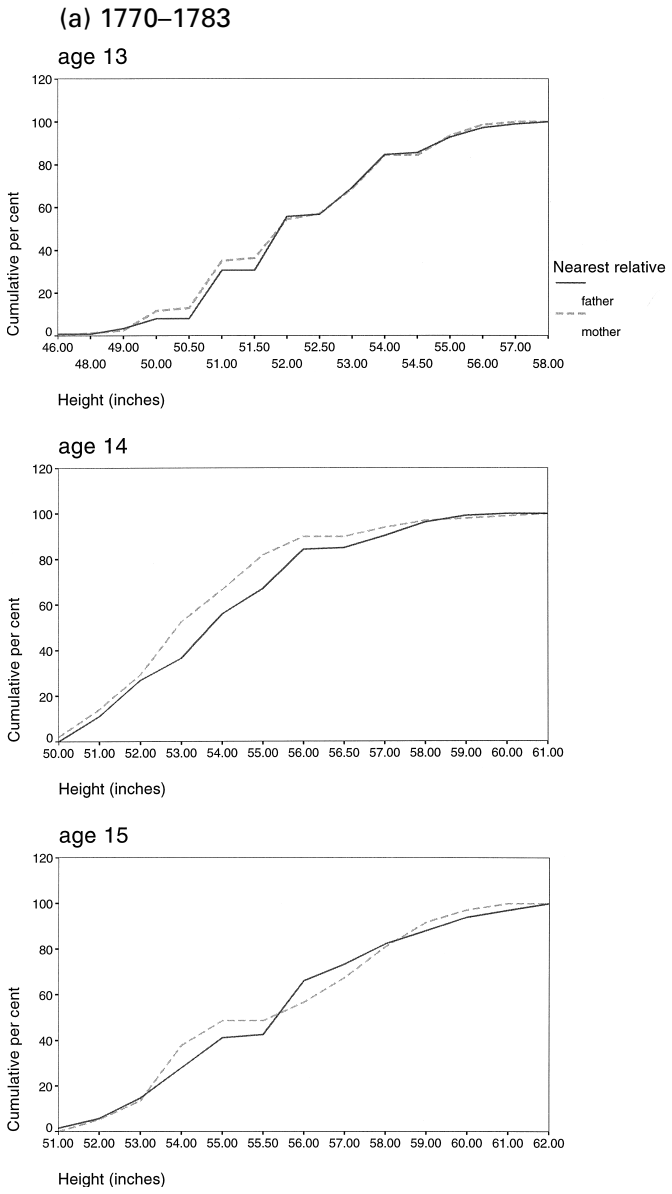

FIGURE 1(a). For legend see page 102.

(b) 1811–1813 (age 13); 1818–1823 (ages 14 and 15)

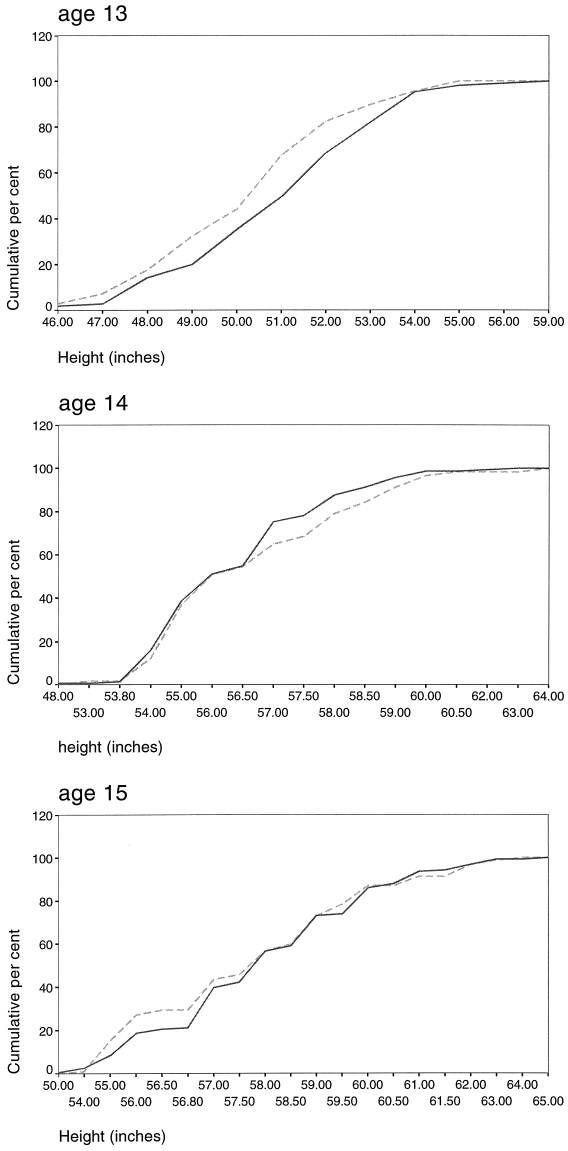

FIGURE 1(b). For legend see page 102.

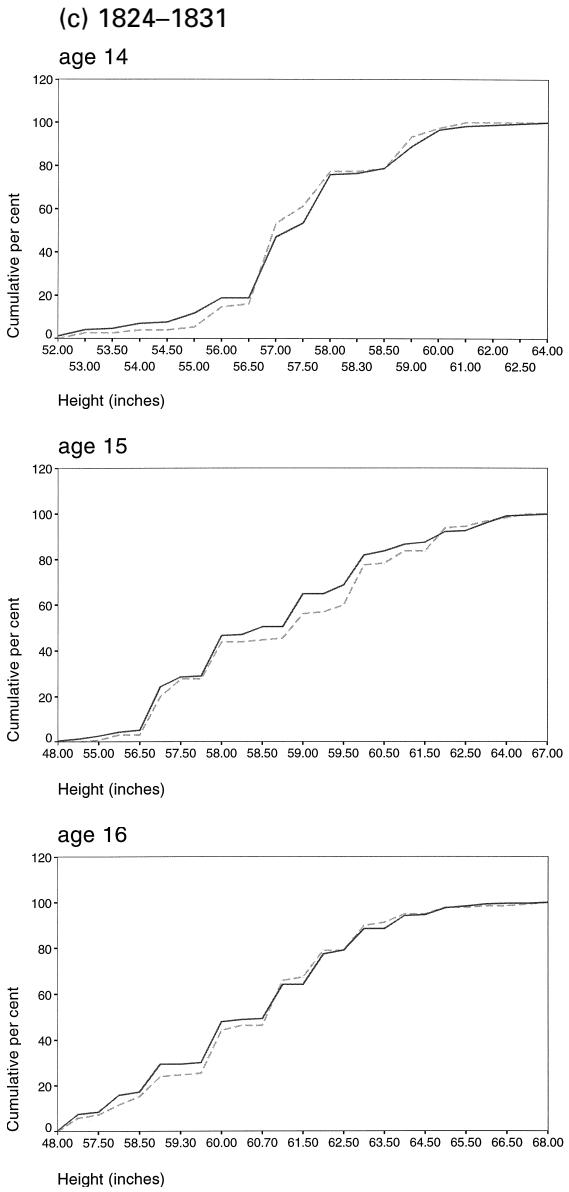

FIGURE 1(c). For legend see facing page.

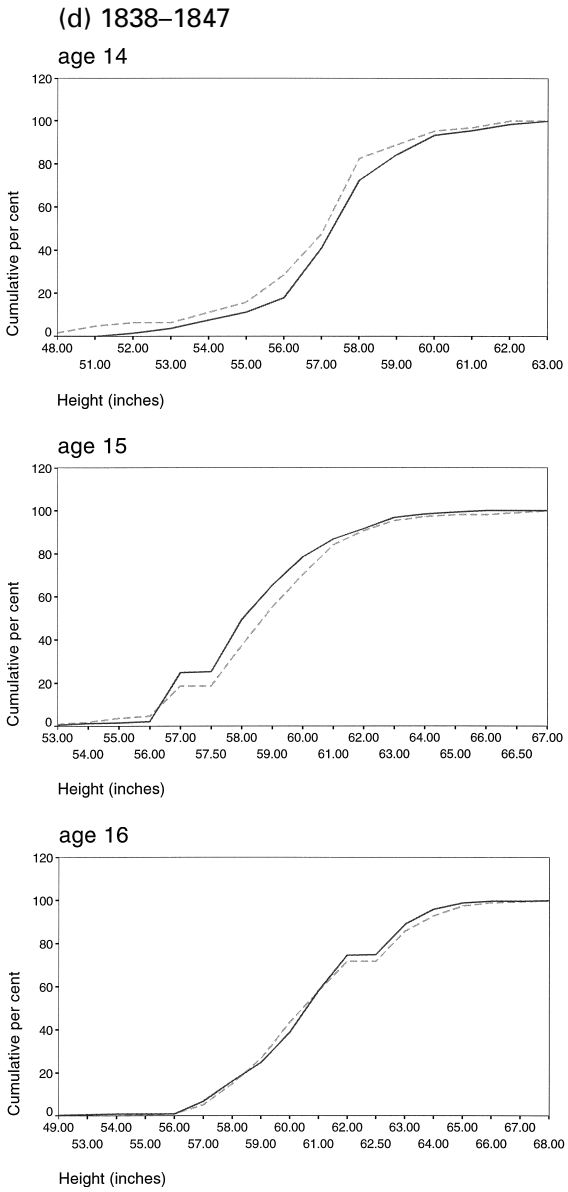

FIGURE 1. Heights of Marine Society boys by age and time period (cumulative %s): (a) 1770–1783, ages 13, 14 & 15; (b) 1811–1813, age 13, and 1818–1823, ages 14 & 15; (c) 1824–1831, ages 14, 15 & 16; and (d) 1838–1847, ages 14, 15 & 16. (Source: ESRC study number 2131–4: *Long-term changes in nutrition, welfare and productivity in Britain*, subsample ESRC 2134; see also R. Floud, K. W. Wachter and A. Gregory, *Height, health and history: nutritional status in the United Kingdom* (Cambridge, 1990).)

subgroups of boys from female-headed households were shorter than their peers with fathers is confirmed by significance tests (see Table 7).

The findings can be tested more rigorously using regression analysis, thus controlling for other characteristics that may also affect height. Elsewhere it has been noted that previous work in agriculture increased a boy's height, while London boys were significantly shorter than those from other parts of the country.[81] We included dummy variables for these aspects of the boy's background, his nearest relative and his age in the regression analysis.[82] All boys below the official height standard in each time period were excluded from the analysis, so avoiding some of the bias inherent in using a truncated sample.[83] The regressions show the increase in height with age and the lower stature of London boys found elsewhere (see Table 8). Having worked in agriculture was never found to be significant. Of interest for our purpose is the shorter stature of fatherless boys up until 1820; these boys are significantly shorter in two of the three subperiods. The consequence of deprivation for height is further emphasized by the greater stunting of the more impoverished destitute boys. However, from 1820 the relationship breaks down.[84] The disappearance of the relationship is explicable. A height standard of 56″/57″ precluded most 13- and 14-year-old boys from being recruited into the Society, but it was only among these age groups that significant differences in height due to fatherlessness were observed. We speculate that boys who entered the Society as fatherless at age 13 were those whose fathers had been absent for some time and whose mothers had been trying to support them until they were of age or stature to be able to be looked after and found employment by a charitable institution such as the Marine Society. Boys who entered aged 16 and recorded a fatherless state were likely to have been recently deprived of their father's support: it is unlikely typically to be the case that the mother supported the boy from age 13 (when he might have been able to enter the Society) to age 16 and then suddenly found herself incapable of supporting him further, so rendering him reliant on charity. Instead the impoverished state is likely to have been recent with no consequence for height at that point in time. Thus we assert that a state of prolonged fatherlessness was more likely for younger boys and was evident in their stunted stature. For older boys fatherlessness was a more recent occurrence with little immediate effect on stature. As the Marine Society increased its minimum height requirement the sample composition shifted towards the latter group. This interpretation is borne out by regressions conducted for the whole sample and grouped subperiods (see Table 9).[85] The variables are the same as previously with the addition of a dummy variable representing decade of birth to capture any trend changes in height. The regression for the period as a whole

TABLE 7
Mean heights of Marine Society boys (inches), 1770–1847

Date received:	*1770–1783*			*1811–1813*	*1818–1823*		*1824–1831*			*1838–1847*		
Age of boy:	*13*	*14*	*15*	*13*	*14*	*15*	*14*	*15*	*16*	*14*	*15*	*16*
Height standard	51″	51″	51″	50/51″	55/56″	55/56″	57″	57″	57″	57″	57″	57″
Sample size	188	233	105	173	194	248	245	364	434	197	417	537
Average height of boys if nearest relative is:												
Father	52.55	54.32	56.07	51.35	56.30	58.18	57.47	58.90	60.72	57.73	59.03	60.93
Mother	52.47	53.76[a]	56.00	50.60[a]	56.65	58.03	57.47	59.18	60.83	57.11[a]	59.43	61.04

[a] Indicates F-test significant at 10 per cent or below.
Source: ESRC 2134 (see note 72).

TABLE 8
Regressions of height of Marine Society boys for certain subperiods

Dependent variable: height	*1770–1783*[a]	*1816–1817*	*1818–1820*	*1821–1823*	*1824–1831*	*1838–1847*
Height standard	51″	54″	55″	56″	57″	57″
Constant	53.28**	57.43*	56.58**	57.36**	58.62**	58.65**
Age 14	1.42**	—[b]	—	—	—	—
Age 15	3.20**	1.43**	1.22**	1.08**	1.06**	0.96**
Age 16	5.05**	2.96**	2.68**	2.42**	2.69**	2.71**
London	−0.35*	−1.90*	—	—	−0.62**	−0.40**
Nearest relative:						
Mother	−0.31*	−0.17	−0.51*	0.46**	0.07	0.18
Other relative (not father)	—	—	—	—	—	0.44**
None (boy destitute)	−0.66**	−0.34	1.11**	1.34**	—	—
Sample size	929	238	361	359	1,267	1,350
$\bar{R}^2$	0.35	0.20	0.20	0.25	0.25	0.22
F	82.6*	12.6*	23.7*	31.0*	103.3*	78.4*

[a] 13-year-olds are included in the analysis for the 1770–1783 period, otherwise excluded. All boys below the official height standard have been excluded from the analysis for all periods.

[b] Dashes for the age 14 category indicate not separately entered in the equation since they cannot have the full range of dummy variables; others indicate that there were no boys with the characteristic in the sample.

* Indicates significance at 10 per cent level.

** Indicates significance at 5 per cent level.

Sources: ESRC 2134 (see note 72).

performs reasonably with all variables having signs in expected directions, but deprivation, as indicated by fatherlessness or being destitute, is not shown to reduce height to a statistically significant extent. However, for both early subsamples (1770–1813 and 1770–1823) being without a father significantly reduced height by up to 0.27″. Recalling the left-hand truncation of the distribution, the true coefficient on height from having a mother as nearest relative would be considerably larger.[86] The coefficient reported represents a lower bound on the true effect. Being destitute had a strong stunting effect until 1813. After 1823 these effects are no longer observable.[87]

The implications of shorter stature for children of lone mothers are twofold. First, boys raised in female-headed households suffered significantly in their physical development. This is particularly noteworthy since

TABLE 9
Regressions of trends in height of Marine Society boys, 1770–1861

	Whole sample					*Truncated OLS*	
	1770–1861	*1770–1813*	*1814–1861*	*1770–1823*	*1824–1861*	*1770–1813*	*1813–1861*
Constant	54.91*	52.69*	55.27*	54.59*	56.28*	53.39*	58.44*
Age 14	1.68*	1.48*	1.41*	1.64*	1.54*	0.97*	0.46*
Age 15	3.41*	3.83*	2.87*	3.62*	2.88*	2.98*	1.32*
Age 16	5.10*	5.43*	4.63*	5.17*	4.54*	4.54*	2.82*
Birth decade:							
1750–1759	−2.01*	0.41*	—	−1.68*	—	0.53*	—
1760–1769	−2.36*	—	—	−2.04*	—	0.25*	—
1770–1779	−1.33*	0.83*	—	−1.11*	—	0.92*	—
1780–1789	−2.25*	0.05	—	−1.96*	—	—	—
1790–1799	−3.53*	−1.21*	—	−3.22*	—	−0.32*	—
1800–1809	—[a]	0.23	—	—	0.07	0.51	−0.56*
1810–1819	1.05*	—	0.99*	2.90*	—	—	−0.34*
1820–1829	1.14*	—	1.15*	—	0.23*	—	—
1830–1839	1.41*	—	1.37*	—	0.40	—	−0.07
1840–1849	0.75*	—	0.75*	—	−0.21*	—	−0.82*
Dummy variables for:							
Working in agriculture	0.30*	0.21	0.35*	0.35*	0.18	0.18	0.33*
Living in London	−0.26*	−0.28*	−0.22*	−0.18	−0.29*	−0.30*	−0.39*
Nearest relative:							
Mother	−0.06	−0.27*	0.03	−0.21*	0.09	−0.16	0.10
Other relative (not father)	0.14*	−0.07	0.21*	−0.05	0.32*	0.04	0.21*
None (boy destitute)	−0.08	−0.49*	0.26*	−0.17	0.13	−0.36*	0.18
$\bar{R}^2$	0.63	0.50	0.35	0.54	0.29	0.40	0.24
F	649.8*	155.2*	202.7*	287.1*	115.1*	88.37*	100.7*
Sample size	6,524	2,030	4,494	3,193	3,331	1,672	3,825

* Significant at 10 per cent level or less. [a] Dashes indicate no observations. *Source:* ESRC 2134 (see note 72).

we have been comparing boys from these families with others who, even by the standards of the late eighteenth century, were both unusually short and came from strongly disadvantaged backgrounds. At a time when stature was equated with strength this constituted a perceived reduction in their human capital, and probably led to reduced earnings at later life stages.[88] Second, some of the increase in heights found from this data set for the early part of the nineteenth century may have been due to changes in the socio-economic background from which the Marine Society recruits came. Table 6 gives the percentage of recruits by type of family over time. There was a rise in the number of boys coming from full families and a decrease in those from deprived backgrounds, thus some of the gain in height will have been due to changes in sample composition.[89] Floud and his colleagues found that average heights of recruits increased by 2″ to 3″ over this period. A small but possibly significant part of this change may have been caused by fewer boys being recruited from female-headed households.

V

The results presented in this article reinforce the usefulness of stature as an indicator of relative deprivation. Children from female-headed households were disadvantaged in a number of ways. They were put to work earlier than other children and often had to accept more physically demanding and dangerous work. These increased energy demands on their bodies were not offset by better nutrition. Low incomes and time constraints forced the children of lone mothers to endure parlous nutritional standards, poor living conditions and, possibly, poisoning. These combined to undermine the well-being of the child who suffered the absence of a father. It also impaired physical stature. Boys introduced to the Marine Society by their mother were consistently more stunted than their also impoverished peers.

These findings have implications for the usefulness of the anthropometric approach. Although it is commonly accepted that changes in height are a good indicator of net nutritional status, the relationship with other indicators of the standard of living, such as real wages, has been much less clear.[90] We demonstrate that within and between relatively homogeneous subsamples we can map from stature to welfare and so endorse the emerging consensus that heights can be used for assessments of relative deprivation.[91] But we also highlight the impact that changes in the underlying sample and inequality will have on the movement of average heights, so obscuring the links between stature and living

standards in the aggregate over time. Elsewhere it has been demonstrated that a doubling of per capita income has the same impact on average heights as a 6 per cent reduction in the Gini coefficient measure of inequality.[92] Changes in the relative position of different sectors of the population and the resultant effect on inequality may explain the paradox of rising incomes and life expectancy coinciding with a deterioration in heights.[92]

Finally, this article documents the deprivation of children of lone mothers. Their disadvantage in terms of health and human capital is apparent. The adverse effects of early working and insufficient food experienced in growing up in a female-headed household suggest a failure to acquire skills and a resulting low level of productivity. Moreover the negative externality – effects beyond the immediate – might impact across generations. Morbidity and low earning power, as indicated by short stature, of the children of lone mothers will have deleterious effects on their offspring when they in turn become parents. The mechanism for an intergenerational transmission of poverty is evident and the long-term effects of deprivation would argue for intervention in the support of these families.

ENDNOTES

1 CAMPOP (the Cambridge Group for the History of Population and Social Structure at Cambridge University) has a collection of population listings for a number of communities for the eighteenth and early nineteenth centuries which provides a breakdown of households by type. These have been used to gauge the extent of lone parenthood in the past; see Richard Wall, 'Some implications of the earnings, income and expenditure patterns of married women in populations in the past', in John Henderson and Richard Wall eds., *Poor women and children in the European past* (London, 1994). For further discussion of these data and their relationship to census estimates of female-headed households, see Jane Humphries, 'Female-headed households in early industrial Britain: the vanguard of the proletariat', *Labour History Review*, Spring 1998, 31–65.

2 Warrington Public Library, Manuscript MS. 748–50. These observations come from household budgets collected as part of a larger project; see Sara Horrell and Jane Humphries, 'Old questions, new data and alternative perspectives: the standard of living of families in the industrial revolution', *Journal of Economic History* **53** (1992), 849–80. In the present article those households without a male head are selected from the full sample for more detailed analysis.

3 Quoted in G. W. Oxley, 'The permanent poor in south-west Lancashire under the Old Poor Law', in J. R. Harris ed., *Liverpool and Merseyside: essays in the economic and social history of the port and its hinterland* (New York, 1969).

4 Rex Watson, 'Poverty in north-east Lancashire in 1843: evidence from Quaker charity records', *Local Population Studies* **55** (1995), 28–45.

5 Norman McCord, 'The Poor Law and philanthropy', in Derek Fraser ed., *The New Poor Law in the nineteenth century* (London, 1976), 87–110.

6 For a discussion of these distinctions and their problematic application to female applicants for poor relief, see Pat Thane, 'Women and the Poor Law in Victorian and Edwardian England', *History Workshop Journal* **6** (1978), 29–51.
7 See Karel Williams, *From pauperism to poverty* (London, 1981); John Knott, *Popular opposition to the 1834 Poor Law* (London, 1986); and G. W. Oxley, *Poor relief in England and Wales, 1601–1834* (London, 1974).
8 Sir Frederic Morton Eden (ed. A. G. L. Rogers), *The state of the poor: a history of the labouring classes in England, with parochial reports* (London, 1928). Inmate lists from Cambridge, Royston and rural Cambridgeshire are illustrative; see E. M. Hampson, *The treatment of poverty in Cambridgeshire, 1597–1834* (Cambridge, 1934), chs. VII, VIII, IX.
9 Possible motivations are examined in more detail in Humphries, 'Female-headed households'.
10 Knott, *Popular opposition to the 1834 Poor Law*, Table 1.1; Knott offers other evidence from Yorkshire to confirm the representativeness of Halifax. See also Eden, *State of the poor*, and for interpretation of the three sets of occasional returns of national-level data before the 1834 Poor Law Commission, see Williams, *From pauperism to poverty*.
11 Brian Harrison and Patricia Hollis eds., *Robert Lowery: radical and Chartist* (London, 1979), 96.
12 Thane, 'Women and the Poor Law'.
13 *Ibid.*
14 The notes to these exceptions explain that the exemption of widows during the first six months was adopted 'with a view to enabling persons thus situated to have an adequate interval for the purpose of making some arrangements for their support as their altered condition may require' and that 'If an able-bodied widow have no children dependent upon her for support, out-door relief cannot be granted to her beyond the six months named in the Article, without the previous consent of the LGB [Local Government Board]'. The notes continue in an even more ominous tone: 'Exception of widows with children, so far as it relates to able-bodied women in employment, is one which the Guardians ought to exercise great circumspection in applying in practice. The Guardians when administering relief under it, ought to take into account, that when small weekly allowances in aid of wages are made they too commonly serve to excuse relations from the payment of contributions to a larger amount; and that the out-door allowances, when given indiscriminately in widowhood, tend to put an end to provident habits, in respect of insurance in sick clubs or otherwise. It should, moreover, be borne in mind, that allowances made by the Parish to the able-bodied widows in employment do not always confer the advantages intended, insomuch as their wages, as in the case of able-bodied men, are commonly reduced in consideration of the allowance from the Parish; and that such reduction of the wages, combined with the excuse furnished to relations or friends for withholding their contributions, together with the pauper habits thus engendered, often renders such allowances to widows in aid of wages an injury rather than a benefit to them … The Commissioners trust that the Guardians will seldom find that the ordinary rate of earnings of able-bodied women is so low as to enable them to support one child at the least; and that the Guardians will not adapt any such general rule as that of relieving all widows with one, or with any fixed number of children, but will make a careful inquiry into every case thus to be relieved.' See W. C. Glen, *The General Orders of the Poor Law Commissioners, the Poor Law Board, and the Local Government Board relating to the Poor Law* (London, 1898), exceptions 4 and 5 to the Outdoor Relief Prohibitory Order, p. 493, n. 1.
15 For the view that outdoor relief persisted in the New Poor Law because of the

difficulties of dealing with cyclical unemployment in the industrial areas and seasonal unemployment in the rural areas via the workhouse and because of the humanity and political interests of local administrators, see Michael Rose, 'Settlement, removal and the New Poor Law', in Fraser, *New Poor Law*, 25–44; David Ashforth, 'The urban poor law', *ibid*., 128–48; Anne Digby, 'The rural poor law', *ibid*., 149–70. Karel Williams on the other hand argues convincingly that the New Poor Law drew a new 'line of exclusion' to successfully deny unemployed men outdoor relief (see *From pauperism to poverty*).

16 In the subsequent crusade against outdoor relief in the 1870s, the lines of exclusion were drawn ever more clearly to their disadvantage.

17 Some authors believe the latter more likely; see K. D. M. Snell and J. Millar, 'Lone parent families and the welfare state: past and present', *Continuity and Change* **2** (1987), 387–422, and Humphries, 'Female-headed households'.

18 Snell and Millar, 'Lone-parent families', 398. For a discussion of whether settlement examinations invariably indicated destitution within the changing legal framework of late Old Poor Law, see Norma Landau, 'The law of settlement and the surveillance of immigration in eighteenth-century Kent', *Continuity and Change* **3** (1988), 202–14; K. D. M. Snell's reply, 'Pauper settlement', *Continuity and Change* **6** (1991), 417–39; and Landau's defence of her original position, 'The eighteenth-century context of the laws of settlement', *Continuity and Change* **6** (1991), 417–39.

19 The 58 cases removed from Leeds in 1851 included 11 widows, 10 single women with bastard children and another single woman who was pregnant; see Rose, 'Settlement'. See also James S. Taylor, *Poverty, migration and settlement in the Industrial Revolution: sojourners' narratives* (Palo Alto, 1989).

20 See Pamela Sharpe, *Adapting to capitalism: working women in the English economy, 1700–1850* (London, 1996).

21 For a survey of the debate and a discussion of new evidence, see Sara Horrell and Jane Humphries, 'Women's labour force participation and the transition to the male-breadwinner family, 1790–1865', *Economic History Review* **XLVIII** (1995), 89–117.

22 Charles H. Feinstein, 'Changes in nominal wages, the cost of living and real wages in the United Kingdom over two centuries, 1780–1990', in Peter Scholliers and Vera Zamagni eds., *Labour's reward: real wages and economic change in 19th- and 20th-century Europe* (Aldershot, 1995), 3–36.

23 This data set has already been used to look at trends in family incomes during the industrial revolution (see Horrell and Humphries, 'Old questions'), married women's participation rates (see Horrell and Humphries, 'Women's labour force participation'), children's participation in paid work (see Sara Horrell and Jane Humphries, '"The exploitation of little children": child labour and the family economy in the British industrial revolution', *Explorations in Economic History* **32** (1995), 485–516), food demand (see Sara Horrell, 'Home demand in British industrialisation', *Journal of Economic History* **56** (1996), 561–604), and the economic circumstances of women and children in female-headed households (see Humphries, 'Female-headed households'). The full data set covers 1,781 working-class household budgets collected from 59 sources including contemporary social commentators, Parliamentary Papers and provincial libraries and record offices for the period 1787 to 1872. The budgets are spread across occupations and geographical locations and provide information on household composition, the earnings and occupations of individuals and patterns of family expenditure. A full description of the sources and details of the budgets is given in Horrell and Humphries, 'Old questions', Appendix 1. The difficulties of working with this kind of data, its reliability and its performance when checked against

independent evidence, are discussed in all these articles. Here we compare evidence for husband-and-wife households for selected occupations with that for families headed by women.

24 The family incomes reported here differ marginally from those reported in other published work because here we limit ourselves to a sample of households whose composition and size are known, but we do not exclude households which simply reported total earnings and not earnings broken down among family members as in earlier work where the objective was to identify sources of income. The small differences in sample composition do not result in significant differences in the relative standing of families by husband's/father's occupation or comparative trends over time.

25 Henry Ashworth, Esq., 'Statistics of the present depression of trade at Bolton; showing the mode in which it affects the different classes of a manufacturing population', *Journal of the Statistical Society of London*, **V** (April 1842), pp. 74–81.

26 Mrs Swinney's story is sketched through her settlement examination and the parish records in Taylor, *Poverty, migration and settlement*, 133–5.

27 See Thane, 'Women and the Poor Law', 44.

28 Horrell and Humphries, '"The exploitation of little children"', 496–501.

29 David Vincent, *Bread, knowledge and freedom: a study of nineteenth-century working class autobiography* (London, 1981), ch. 3.

30 Humphries finds an age difference of this size in a sample of Chartist biographies; see her 'Female-headed households'.

31 For a summary of this evidence, see Humphries, 'Female-headed households'.

32 The case is described in Hampson, *The treatment of poverty*, 151.

33 Linda A. Pollock, *Forgotten children: parent–child relations from 1500 to 1900* (London, 1983), 62–3.

34 Compare A. E. Musson, 'Robert Blincoe and the early factory system', *Derbyshire Miscellany* **I** (1958), 111–17, with, for example, G. Elson, *The last of the climbing boys: an autobiography* (London, 1900); see also Marjorie Cruickshank, *Children and industry: child health and welfare in north-western textile towns during the nineteenth century* (Manchester, 1981), 13–17.

35 And no illegitimate children born after widowhood; see Glen, *The General Orders*.

36 See Humphries, 'Female-headed households', Horrell and Humphries, 'Women's labour force participation', and Peter Earle, 'The female labour market in London in the late seventeenth and early eighteenth centuries', *Economic History Review* **XLII** (1989), 328–54.

37 Eden, *State of the poor*, 100.

38 Carole Shammas, 'The eighteenth-century English diet and economic change', *Explorations in Economic History* **21** (1984), 256. This work also calculates income elasticities for the various foodstuffs and confirms the luxury nature of tea and sugar.

39 For a full description and analysis of the expenditure information available in these budgets see Horrell, 'Home demand'.

40 Expenditure on each category of food in husband-and-wife households from the Eden and Davies budgets was regressed on the number of adult equivalents in the household, a regional price index (taken from N. F. R. Crafts, 'English workers' real wages during the industrial revolution: some remaining problems', *Journal of Economic History* **45** (1985), 139–44), total expenditure, cost-of-living index (see Feinstein, 'Changes in nominal wages'), a dummy variable for urban occupation (factory and trades occupations for man or male child aged over 15) and a dummy variable for primary occupation (agriculture and mining for man or male child aged over 15). Coefficients

from these regressions were then applied to the female-headed households to give predicted expenditures to compare with actual expenditure on different food categories.

41 See Shammas, 'The eighteenth-century English diet', 261.

42 Quoted in John Burnett, *Plenty and want: a social history of food in England from 1815 to the present day* (3rd edition, London, 1989), 249.

43 This survey is analyzed in Derek J. Oddy, 'Urban famine in nineteenth-century Britain: the effect of the Lancashire cotton famine on working-class diet and health', *Economic History Review* **XXXVI** (1983), 68–86.

44 Shammas, 'The eighteenth-century English diet'.

45 Gregory Clark, Michael Huberman and Peter H. Lindert, 'A British food puzzle', *Economic History Review* **XLVIII** (1995), 234.

46 See Burnett, *Plenty and want*.

47 *Ibid.*, 4.

48 Jan de Vries, 'Between purchasing power and the world of goods: understanding the household economy in early modern Europe', in John Brewer and Roy Porter eds., *Consumption and the world of goods* (London, 1993), 85–132, and 'The industrial revolution and the industrious revolution', *Journal of Economic History* **54** (1994), 249–70.

49 Burnett, *Plenty and want*, 7, 42.

50 See Ivy Pinchbeck, *Women workers in the industrial revolution* (London, 1977; 1st edition 1930) and Oddy, 'Urban famine'.

51 Using information on calories per penny of expenditure from Shammas, 'The eighteenth-century English diet'.

52 Here we calculate the calories purchased in these dietaries; the calories actually consumed may have been somewhat less due to spoilage. Furthermore, the calories digested would be lower than the calories consumed, the difference being dictated by the palatability of the food.

53 Shammas, 'The eighteenth-century English diet', 257.

54 Although these households suffered low levels of nutrition, this is not unambiguous evidence that malnutrition occurred as there is considerable inter-individual variability in actual requirements and comparisons with recommended intakes are not sufficient to assess health. This has been recognized in more recent studies of diet. See, for example, United Nations Food and Agriculture Organization, *Energy and protein requirements*, report of a joint FAO/WHO Ad-hoc Expert Group (Rome, 1971), 2.

55 See Oddy, 'Urban famine', and Burnett, *Plenty and want*, for discussion of these surveys. Although they were not starvation diets, on 2,555 calories per day the single female factory operatives provide an informed basis for our comparisons. Two-thirds of the needlewomen were supporting themselves, so again they provide a useful comparison with the adult females in our sample.

56 Eden, *State of the poor*, 107–8. However, Eden is sceptical about this argument as he considers that tea-drinking in the south must have required as much fuel to boil the kettle twice a day as the more nutritious cooking required.

57 Oddy, 'Urban famine'.

58 Pinchbeck, *Women workers*, 104.

59 'Report of an investigation' reprinted in Richard Wall, *Slum conditions in London and Dublin* (Farnborough, 1974).

60 Consideration of the rents paid in the 13 female-headed households for which this information was available compared with those paid by husband-and-wife households revealed that they were similar over time to those paid by outworkers, so 170 outworking households were used as a comparison. Outworkers' rents were significantly

higher in London and Manchester so a dummy variable was constructed to account for this. Rents were regressed on household size, a time trend and the area dummy.

61 There were no lodgers in any of the households for which rent information was available.

62 'Report of an investigation', in Wall, *Slum conditions*.

63 See J. M. Tanner, 'Potential of auxological data for monitoring economic and social well-being', *Social Science History* **6** (1982), 571–81, and Roderick Floud and Kenneth W. Wachter, 'Poverty and physical stature', *Social Science History* **6** (1982), 450.

64 Friedrich Engels, *The condition of the working class in England* (Harmondsworth, Middlesex, 1987; first published in Germany in 1845, in the UK in 1892), 134–5.

65 See Pinchbeck, *Women workers*.

66 Adults too were regular users of opiates to combat these ills and this must also have led to low birth weight of children, the main predictor of future health; see Robert W. Fogel, 'The escape from hunger and premature death, 1700–2100: Europe, America and the Third World', Ellen McArthur Lectures, Cambridge, November 1996 (forthcoming).

67 From Parliamentary Papers, 1843, XIV, *Children's Employment Commission: appendix to the second report of the Commissioners* (*Trade and Manufactures*), Pt I, fos. 61–2. Quoted in Virginia Berridge and Griffith Edward, *Opium and the people: opiate use in nineteenth-century England* (London, 1981), 102.

68 For full details of this data set, see Roderick Floud, Kenneth W. Wachter and Annabel Gregory, *Height, health and history: nutritional status in the United Kingdom* (Cambridge, 1990).

69 John Komlos, 'The secular trend in the biological standard of living', *Economic History Review* **XLVI** (1993), 130–1.

70 See Peter Kirby, 'Causes of short stature among coal-mining children, 1823–1850', *Economic History Review* **XLVIII** (1995), 687–99, and Jane Humphries, 'Short stature among coal-mining children: a comment', *Economic History Review* **L** (1997), 25–64.

71 For full details of this data set, see Floud, Wachter and Gregory, *Height, health and history*.

72 The data set collected by Floud *et al*. (see note 68, above) is available as ESRC study number 2131–4: *Long-term changes in nutrition, welfare and productivity in Britain*. The subsample is ESRC 2134. For this sample the recruiting officer systematically recorded the name, address and occupation of a parent or relative, if the boy had one, the boy's occupation, his geographical origin, age and height.

73 It is clear that the recruiting officer did make a concerted effort to gather this information: after 1775 this space was left incomplete for only 2–3 per cent of the recruits (see Table 6).

74 The existence of a particularly high proportion of female-headed households during the Napoleonic wars has been identified elsewhere; see Humphries, 'Female-headed households'.

75 Destitute boys were those recorded as 'destitute', 'friendless', 'foundling','from a workhouse', 'vagrant', 'orphan', 'in the streets', 'distressed boy', 'illegitimate' or 'no relative'; see Floud *et al*., *Health, height and history*, 5a.

76 See Sara Horrell and Jane Humphries, 'The origins and expansion of the male-breadwinner family: the case of nineteenth-century Britain', *International Review of Social History* **42** (1997), 25–64.

77 Two other groups of boys were recruited to the Marine Society: those parented by another relative (boys who presumably might have lost a father or mother but might not have spent time without a male head of household such as a stepfather or grandfather),

and those for whom there was no nearest relative or friend – the boys who were on the street or arrived from a workhouse and were generally destitute. The analysis controls for these groups, distinguishing them from those with and without fathers, but it does not specifically attempt to quantify the effect of these states on their stature.

78 See Floud and Wachter, 'Poverty and physical stature', 430.

79 Boys who gave another relative as their next-of-kin and destitute boys were older than those who had a father or mother. The age difference is reflected in taller average height for these destitute boys after 1783.

80 Diagrams were drawn for those age groups and subperiods for which there were sufficient observations to make comparisons feasible.

81 See Floud and Wachter, 'Poverty and physical stature', and Komlos, 'The secular trend'.

82 Only boys aged 13–16 (1770–1783) and 14–16 (1816–1847) were included as there were very few cases in the data from other age groups. Other authors have shown that having smallpox had an adverse effect on height and that literacy was positively correlated with height and so captured some of the inequalities in background of the boys; see Hans-Joachim Voth and Timothy Leunig, 'Did smallpox reduce height? Stature and the standard of living in London, 1770–1873', *Economic History Review* **XLIX** (1996), 541–60, and Komlos, 'The secular trend'. However, the consistency of the recording of these variables over time and their empirical relationship are contested (see articles by P. E. Razzell and by H. J. Voth and T. Leunig forthcoming in the *Economic History Review*). Furthermore, height and smallpox likely suffer from multicolinearity so we have omitted them from the regression analysis.

83 See Komlos, 'The secular trend', and references therein, for discussion of the merits of performing truncated ordinary least squares regressions on the Marine Society data. It has been demonstrated that the quartile bend estimator (QBE) procedure to compensate for truncation is inappropriate if the sample departs from normality or if two parts of the distribution have been superimposed upon one another giving a bimodal distribution, as we hypothesize to be the case when comparing boys with and without fathers.

84 In fact there is some evidence that boys from deprived backgrounds were taller than their better-off counterparts. This is a consequence of the particularly short 14-year-olds with fathers who were accepted above the height standard in 1818–1823 (see Figure 1). It is possible that recruiting officers were compensating for other deficiencies of a deprived background which might be reflected in height if they took only taller boys from these groups, but we are unable to test this hypothesis.

85 Only boys aged 13 to 16 were included in the analysis and those whose next-of-kin or destitute state is unknown were excluded. Two subperiods were chosen, 1770–1783 when the height standard was usually below 52″ and 1770–1813 when the height standard was less than 57″.

86 The idea here is that we are looking at two overlapping normal distributions where the height requirement causes truncation of the sample and allows only partial observation of the whole distribution. The observed means of these distributions will thus overstate the true means and the bias will be more pronounced in the distribution closest to the height requirement, the one for fatherless boys.

87 The significance of being fatherless for height is removed if truncated OLS estimation is performed (see Table 9). This procedure results in biased coefficient estimates but the sign and relative magnitudes of the coefficient are deemed to be correct; see Komlos, 'The secular trend'. Although being fatherless still shows reduced stature, removal of all boys below 52″ before 1813 will disproportionately remove the shorter fatherless

boys and younger boys between whom the height differences are more evident (see Figure 1). Thus it is not surprising that truncated OLS removes the significance of the effect on height of fatherlessness.

88 Unless it can be shown that catch-up growth occurred. See Richard H. Steckel, 'A peculiar population: the nutrition, health and mortality of American slaves from childhood to maturity', *Journal of Economic History* **46** (1986), 721–42, for a discussion of this phenomenon.

89 Being fatherless or destitute reduced height by a minimum of 0.3″ and the proportion in these groups declined from 50 to 20 per cent of the whole sample from 1780–1782 to 1860–1861, so average height would rise 0.066″ through this effect alone.

90 See Robert W. Fogel, 'Physical growth as a measure of economic well-being of populations: the eighteenth and nineteenth centuries', in Frank Falkner and J. M. Tanner eds., *Human growth*, vol. 3 (2nd edition, New York, 1986), 263 ff., and Floud, Wachter and Gregory, *Height, health and history*, pp. 16 ff., for a discussion of the relationship between heights and nutritional status and, for example, N. F. R. Crafts, 'Cliometrics, 1971–1986: a survey', *Journal of Applied Econometrics* **2** (1987), 189, and 'Some dimensions of the "Quality of Life" during the British industrial revolution' (unpublished manuscript, London School of Economics, April 1996, 8), and Stephen Nicholas and Paul Johnson, 'Health and welfare of women in the United Kingdom 1785–1920', unpublished paper presented at NBER conference on 'Health and Welfare during Industrialisation', Cambridge, Mass., 21–22 April 1995, 1, for doubts about the relationship with other measures of living standards.

91 See, for example, the implications drawn from an analysis of the relative heights of male and female convicts transported to Australia in Stephen Nicholas and Deborah Oxley, 'The living standards of women during the industrial revolution, 1795–1820', *Economic History Review* **XLVI** (1993), 723–49.

92 See Richard H. Steckel, 'Height and per capita income', *Historical Methods* **15** (1982), 1–7.

93 See John Komlos, *Nutrition and economic development in the eighteenth-century Habsburg monarchy* (Princeton, 1989), and 'Anomalies in economic history: toward a resolution of the "Antebellum puzzle"', *Journal of Economic History* **56** (1996), 202–14.