ORIGINAL ARTICLE

Factors associated with different hygiene practices in the homes of 15 month old infants

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Background: Improved hygiene in Westernised regions of the world may be partly responsible for the increased prevalence of diseases of the immune system, such as asthma and atopy. There is a paucity of data on cleanliness norms in young children in the UK and there has been no attempt to identify factors that influence the adoption of particular hygiene practices in the home.
Aims: To examine levels of hygiene in a contemporary cohort of children and identify social and lifestyle factors influencing hygiene practices in the home.
Methods: The sample under study are participants in the Avon Longitudinal Study of Parents and Children (ALSPAC). Parental self completion questionnaires provided data on hygiene levels in children at 15 months of age, and a hygiene score was derived from these responses. Multivariable logistic regression models investigated associations between high hygiene scores (top quintile) and a number of perinatal, maternal, social, and environmental factors.
Results: Maternal smoking during pregnancy, low maternal educational achievement, and living in local authority housing were factors independently associated with high hygiene scores, as was increased use of chemical household products. High hygiene scores were inversely related to living in damp housing and attendance at day care. There were no gender or ethnic differences in hygiene score.
Conclusion: Important data on cleanliness norms for infants have been presented. The adoption of hygiene practices is influenced to some degree by social, lifestyle, and environmental factors—with higher hygiene scores occurring in more socially disadvantaged groups. Increased use of chemical household products in the more socially disadvantaged groups within ALSPAC has emerged as an important confounder in any study of hygiene and ill health.

There is little doubt that inadequate hygiene practices increase the risk of infection. Infectious diseases prior to the introduction of antibiotics were the single highest cause of mortality in the general population.[1] With the introduction of antibiotics, improvements in sanitation, and the promotion of effective hygiene practices in the home, these fatal infectious diseases have all but been eradicated. In contrast, however, diseases of the immune system, including asthma and atopy, have risen dramatically in prevalence over the past few decades.[2–5] Consequently it has been suggested that improved hygiene practices in the West may be partly responsible for the increased prevalence of asthma and atopy.[6] The "hygiene hypothesis" proposes that exposure to infectious agents in childhood stimulates the immune system in favour of a Th1 response which inhibits production of Th2 cells associated with increased IgE, eosinophillia, atopy, and airway hyper-responsiveness.[7] The question arises whether certain hygiene practices inhibit exposure to infectious agents, which in turn would promote production of allergy inducing Th2 cells.

The putative association between hygiene and atopy may be confounded and/or mediated by a number of factors, not yet accounted for in many of the published studies. Little is known about hygiene practices in the home or norms of cleanliness in the United Kingdom today and virtually no information is available on the social, demographic, or lifestyle factors influencing hygiene practices.

This paper draws on unique data gathered in the Avon Longitudinal Study of Parents and Children (ALSPAC)[8] to provide cleanliness norms for infants aged 15 months. In addition, data gathered prospectively from as early in pregnancy as possible, may identify social, demographic, and lifestyle factors influencing hygiene practices within the home. We attempt to analyse as many relevant factors as possible, ranging from factors that may directly affect hygiene levels, to those who may have an influence on the adoption of the particular practice, to those that may have a mediating, confounding, or interacting effect with hygiene in its putative association with atopic diseases.

METHODS

Subjects

The Avon Longitudinal Study of Parents and Children (ALSPAC), formerly known as the Avon Longitudinal Study of Pregnancy and Childhood,[8] is a prospective study of 14 541 pregnancies. Women were enrolled as early in pregnancy as possible on the basis of an expected date of delivery between 1 April 1991 and 31 December 1992, and place of residence within the three Bristol based health districts of the former county of Avon, UK. It was estimated between 85% and 90% of eligible mothers were enrolled in the study. Of the 14 541 pregnancies enrolled, 13 988 children had survived to one year.

Data were collected using a variety of sources, including questionnaires completed by the parents, medical records, biological samples, and hands-on examination of the whole cohort from 7 years of age at a research clinic. The ALSPAC website contains detailed information on the study design, data gathered, clinic measurements, and questionnaire response rates (http://www.ich.bris.ac.uk/alspac).

Abbreviations: ALSPAC, Avon Longitudinal Study of Parents and Children; ETS, environmental tobacco smoke

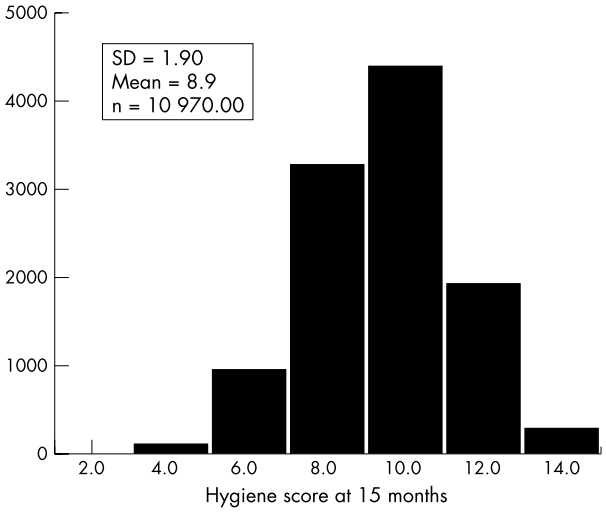

Figure 1 Hygiene score at 15 months.

Hygiene score

When their child was 15 months of age, parents were asked how often in a normal day was their child's face and hands wiped, and hands wiped before meals. Responses ranged from "not at all" to "five or more times per day". In addition, parents were asked how often their child was given a bath or shower, with responses ranging from "hardly ever" to "more than once a day". From these responses a simple cumulative infant hygiene score was derived (ranging from least hygienic to most hygienic).

Putative influencing factors

Possible influential factors of hygiene practices in the home were taken from self report questionnaires returned by the study mothers from early pregnancy throughout the first year of life of the study child. For some factors, there were multiple time points that the particular question was asked. In these cases, an effort was made to use data collected at the same time, or as close as possible prior to the time the hygiene questions were asked.

Perinatal factors

Birth weight, gestational age, and gender were abstracted from obstetric records. Maternal parity, defined as the number of previous pregnancies resulting in a live birth or fetal death after 28 weeks gestation (0, 1, 2+), was ascertained from a questionnaire administered to the study mothers during pregnancy (at 32 weeks gestation); ethnicity of the study child was determined at 32 weeks gestation. When her baby was 6 months old, each mother was asked about her infant's mode of feeding in the previous six months. From this the duration of breast feeding up to and including 6 months of age was determined.

Maternal factors

Maternal smoking during pregnancy in the final trimester and highest maternal educational achievement were ascertained from maternal questionnaires completed during pregnancy (32 weeks gestation). Maternal age at delivery was obtained from obstetric records and was categorised into three groups (<20 years, 20–24 years, 25+ years). Maternal paracetamol use in the final trimester of pregnancy was obtained from the 32 week questionnaire; responses were recoded as: never, sometimes, most days/every day. A history of asthma/eczema in the mother of the study child was ascertained at 12 weeks postnatally.

Social factors

Housing tenure (mortgaged/owned, local authority rented, other), damp, mould, or condensation in the home, and reports of financial difficulties were obtained from a questionnaire sent out when the study child was 8 months of age.

Environmental factors

When the children were 15 months of age, exposure to environmental tobacco smoke (ETS) at the weekend was determined. The responses were categorised as: never, <1 hour, 1–2 hours, 3–5 hours, always. Also at 15 months, mothers were asked which of the following pets the study child had been in contact with on at least one occasion during the week, either in the home or elsewhere: cats, dogs, other furry pets, other non-furry pets. At regular intervals postpartum, study mothers were asked about the frequency and use of household chemicals such as disinfectant, bleach, aerosols, etc. A score was derived that reflected frequency of use of these chemicals in the home at 8 months of age.

The month in which the 15 months questionnaire was returned was also analysed according to hygiene score to account for any seasonal changes in hygiene practices.

Statistical analysis

All data were analysed using SPSS for Windows (version 9.0.0). The hygiene scores were approximately normally distributed (fig 1). Quintiles of the hygiene scores were derived for categorical descriptive analyses. The hygiene score was dichotomised, with scores above 10 (top quintile) representing the group with high hygiene scores and scores of 10 or below representing the reference group. Unadjusted analyses using logistic regression models were carried out for all factors. Multivariable logistic regression models using backwards method of elimination assessed which factors were independently associated with a high hygiene score. The modelling was carried out in three stages. Factors were analysed univariably in the first instance. Next the factors within each of the perinatal, maternal, social, and environmental groups were analysed simultaneously (within groups). All significant factors from the previous stage were then combined in a final model (between groups) to assess independent predictors of high hygiene scores. Statistical significance was based on a 5% significance level using the likelihood ratio statistic.

Table 1 Frequency of hands and face washing and bathing and showering in 15 month old children

Hygiene question	Responses				
How often in a normal day:	Not at all	1–2 times	3–4 times	5 or more times	
Is his/her face washed	0.2 (23)	28.4 (3127)	60.8 (6711)	10.6 (1166)	
Are his/her hands washed/wiped	0.05 (5)	13.4 (1475)	62.2 (6862)	24.3 (2684)	
How often in a normal day:	Never	Occasionally	Sometimes	Usually	Always
Are hands cleaned before meals	5.5 (604)	14.6 (1615)	29.1 (3209)	36.3 (4017)	14.5 (1600)
How often does he/she usually:	Hardly ever	Once a week	Several times a week	Once every day	More than once a day
Have a bath or shower	0.1 (13)	4.2 (460)	35.5 (3912)	54.8 (6046)	5.4 (599)

Table 2 Univariable associations: perinatal, maternal, social, and environmental associations with hygiene quintile at 15 months of age

	Hygiene score quintile					Unadjusted OR (95% CI)*	p
	1	2	3	4	5		
Hygiene score range	0–7	8	9	10	11+		
All children % (n)	22.1 (2429)	17.6 (1936)	21.4 (2346)	18.5 (2034)	20.3 (2225)		
Perinatal factors							
Gender							
Male	22.9 (1297)	17.0 (965)	20.9 (1183)	18.5 (1048)	20.7 (1170)	1	
Female	21.3 (1132)	18.3 (971)	21.9 (1163)	18.6 (986)	19.9 (1055)	1.05 (0.96 to 1.15)	0.31
Maternal parity							
0	25.2 (1194)	17.9 (852)	20.5 (972)	17.9 (849)	18.5 (880)	1	<0.0001
1	19.5 (713)	18.0 (658)	23.0 (844)	19.3 (707)	20.2 (741)	1.11 (0.9 to 1.24)	
2+	20.3 (436)	16.9 (362)	21.0 (451)	18.4 (395)	23.3 (499)	1.33 (1.18 to 1.51)	
Duration of breast feeding							
Never	22.2 (524)	15.7 (371)	20.0 (472)	19.4 (459)	22.7 (535)	1	<0.0001
<1 month	22.8 (372)	17.6 (288)	22.2 (363)	17.9 (293)	19.5 (319)	0.83 (0.71 to 0.97)	
1–3 months	21.6 (336)	19.2 (300)	20.1 (314)	19.1 (298)	19.9 (311)	0.85 (0.73 to 0.99)	
3–6 months	23.1 (299)	18.0 (233)	21.2 (275)	18.6 (241)	19.1 (247)	0.80 (0.68 to 0.95)	
>6 months	22.8 (724)	18.3 (582)	23.2 (739)	18.4 (586)	17.3 (549)	0.71 (0.62 to 0.81)	
Maternal factors							
Maternal smoking during pregnancy							
None	22.8 (1931)	18.3 (1554)	22.2 (1877)	18.3 (1547)	18.4 (1562)	1	<0.0001
1–9 per day	20.5 (149)	16.7 (121)	19.3 (140)	20.4 (148)	23.1 (168)	1.33 (1.11 to 1.60)	
10–19 per day	18.7 (152)	13.9 (113)	17.5 (143)	20.5 (167)	29.4 (240)	1.85 (1.57 to 2.17)	
20+ per day	18.4 (54)	11.9 (35)	18.7 (55)	17.7 (52)	33.3 (98)	2.21 (1.72 to 2.54)	
Maternal highest educational qualification							
CSE	21.1 (386)	15.2 (278)	20.7 (379)	17.1 (314)	26.0 (476)	2.21 (1.84 to 2.65)	<0.0001
Vocational	24.3 (244)	17.6 (177)	18.6 (187)	19.4 (195)	20.1 (202)	1.59 (1.28 to 1.97)	
O level	22.1 (823)	17.7 (662)	21.8 (814)	19.1 (713)	19.3 (719)	1.51 (1.27 to 1.78)	
A level	19.8 (495)	17.4 (436)	22.3 (558)	20.0 (500)	20.6 (516)	1.64 (1.37 to 1.95)	
Degree	26.7 (391)	21.1 (309)	22.5 (329)	15.9 (233)	13.7 (200)	1	
Childcare by childminder/nursery (>10 hours per week)							
No	21.8 (1948)	17.0 (1518)	20.8 (1861)	18.9 (1693)	21.5 (1928)	1	
Yes	24.0 (458)	20.9 (399)	24.1 (459)	16.8 (321)	14.2 (271)	0.60 (0.53 to 0.69)	<0.0001
Maternal eczema							
No	22.1 (1790)	17.8 (1438)	21.1 (1707)	18.3 (1483)	20.7 (1674)	1	0.0015
Yes	22.8 (555)	17.5 (426)	23.2 (563)	18.7 (455)	17.7 (431)	0.8 (0.7 to 0.9)	
Social factors							
Housing tenure at 8 months							
Local authority housing	18.7 (230)	15.6 (192)	18.2 (223)	20.0 (246)	27.4 (337)	1.64 (1.43 to 1.89)	<0.0001
Private rented	24.5 (225)	16.5 (152)	20.8 (191)	19.2 (177)	19.0 (175)	1.02 (0.86 to 1.22)	
Mortgaged/owned	22.6 (1829)	18.1 (1460)	22.3 (1799)	18.3 (1479)	18.7 (1510)	1	
Damp, mould, condensation at 8 months							
No	21.3 (1136)	16.7 (890)	21.3 (1137)	19.5 (1039)	21.1 (1127)	1	0.0006
Yes	23.5 (1147)	18.7 (916)	21.9 (1070)	17.5 (856)	18.4 (902)	0.84 (0.76 to 0.93)	
Overcrowding							
<0.5 persons per room	22.3 (412)	18.1 (334)	23.0 (425)	18.2 (337)	18.4 (340)	1	0.02
0.5–0.75 persons per room	21.9 (795)	18.2 (661)	23.2 (839)	17.9 (647)	18.8 (682)	1.03 (0.89 to 1.19)	
0.75–1 persons per room	22.4 (349)	18.2 (283)	21.6 (336)	18.5 (288)	19.2 (299)	1.06 (0.89 to 1.25)	
>1 persons per room	23.4 (531)	16.5 (375)	21.8 (446)	18.7 (426)	21.8 (495)	1.23 (1.06 to 1.44)	
Environmental factors							
Weekly contact with non-furry pets:							
No	22.3 (2171)	17.9 (1739)	21.5 (2096)	18.5 (1799)	19.8 (1930)	1	0.0003
Yes	20.9 (2171)	17.9 (1739)	21.5 (2096)	18.5 (1799)	19.8 (1930)	1.3 (1.13 to 1.5)	
Chemical exposure score							
@ 8 months postnatal	15.5 (5.1)	16.2 (5.1)	16.6 (5.2)	17.5 (5.2)	18.3 (5.6)	1.1 (1.06 to 1.08)	<0.0001
Month of questionnaire return (for hygiene score @ 15 months)							
October–March (winter)	24.5 (1532)	18.7 (1169)	21.3 (1327)	18.1 (1127)	17.4 (1088)	0.7 (0.6 to 0.8)	<0.0001
April–September (summer)	19.0 (890)	16.2 (758)	21.6 (1015)	19.2 (899)	24.1 (1130)	1	

*Unadjusted odds ratios for top quintile of hygiene score versus bottom 4 quintiles.

RESULTS

Cleanliness norms

Table 1 presents the frequencies of face and hands washing, and bathing and showering in 15 month old children. In total 10 970 children had hygiene scores derived from these frequencies. The hygiene scores ranged from 2 (least hygienic) to 14 (most hygienic), and were approximately normally distributed with a mean of 9 and a standard deviation of 2 (fig 1). The majority of children were having their face and hands washed between three and four times per day, usually having their hands cleaned before meals, and bathing or showering once every day. Forty three (0.4%) children had a score of 14, which translated into them having their face and hands washed more than five times a day, always having their hands washed before meals, and having a bath or shower more than once a day.

Table 2 shows cross tabulations between perinatal, maternal, social, and environmental factors and hygiene score quintile alongside the unadjusted odds ratios and 95% confidence intervals for a high hygiene score (>10 versus ⩽10 as baseline). Table 3 presents results from the within group analyses (that is, within each of the perinatal, social, maternal,

Table 3 Adjusted odds ratios (95% CI)* for a high hygiene score according to perinatal, maternal, social, and environmental factors adjusted within and between groups

	Within group		Between groups	
Group	Adjusted OR (95% CI)	p	Adjusted OR (95% CI)	p
Perinatal factors				
Maternal parity				
0	1	0.0004	NS	
1	1.11 (0.9 to 1.2)			
2+	1.3 (1.15 to 1.5)			
Duration of breast feeding				
Never	1	0.0002	NS	
<1 month	0.9 (0.7 to 1.02)			
1–3 months	0.9 (0.7 to 1.03)			
3–6 months	0.8 (0.7 to 0.9)			
>6 months	0.7 (0.6 to 0.8)			
Maternal factors				
Maternal smoking during pregnancy				
None	1	<0.0001	1	<0.0001
1–9 per day	1.25 (1.03 to 1.51)		1.34 (1.09 to 1.66)	
10–19 per day	1.63 (1.37 to 1.94)		1.77 (1.44 to 2.18)	
20+ per day	1.97 (1.51 to 2.57)		2.18 (1.6 to 2.98)	
Maternal highest educational qualification				
CSE	1.61 (1.32 to 1.97)	<0.0001	1.3 (1.01 to 1.6)	0.0003
Vocational	1.23 (0.9 to 1.53)		1.02 (0.8 to 1.3)	
O level	1.24 (1.04 to 1.5)		1.02 (0.8 to 1.2)	
A level	1.54 (1.28 to 1.83)		1.3 (1.1 to 1.6)	
Degree	1		1	
Childcare by childminder/nursery (>10 hours per week)				
No	1	<0.0001	1	<0.0001
Yes	0.67 (0.58 to 0.78)		0.72 (0.62 to 0.85)	
Maternal eczema				
No	1	0.0007	1	0.004
Yes	0.81 (0.71 to 0.91)		0.83 (0.73 to 0.94)	
Social factors				
Housing tenure				
Local authority housing	1.68 (1.44 to 1.97)	<0.0001	1.36 (1.14 to 1.62)	0.003
Private rented	1.10 (0.91 to 1.32)		1.01 (0.83 to 1.23)	
Mortgaged/owned	1		1	
Damp housing (8 months)				
No	1	0.0004	1	0.001
Yes	0.82 (0.74 to 0.92)		0.8 (0.7 to 0.9)	
Environmental factors				
Weekly contact with pets				
Non-furry pets (v none)	1.2 (1.01 to 1.4)	0.03	1.2 (1.02 to 1.4)	0.03
Chemical exposure score:				
At 8 months	1.07 (1.06 to 1.08)	<0.0001	1.07 (1.06 to 1.08)	<0.0001
Month of questionnaire return (for hygiene score @ 15 months)				
October–March (winter)	0.64 (0.58 to 0.71)		0.63 (0.6 to 0.7)	<0.0001
April–September (summer)	1	<0.0001	1	

*Adjusted OR (95% CI) are calculated comparing the top quintile of hygiene score versus the bottom 4 quintiles.

and environmental groups) and from the between group analyses. Fuller versions of tables 2 and 3 can be viewed on the *ADC* website (www.archdischild.com).

Perinatal factors

High maternal parity (of 2 or more) was associated with high hygiene scores (table 2). Children who had never been breast fed during the first six months were more likely to have high hygiene scores than breast fed children. However, these effects were not independent of other maternal and social factors, and in particular maternal smoking during pregnancy (table 3). Boys were no more likely to have a high hygiene score than girls and there was no statistically significant difference between ethnic groups. High hygiene scores were not associated with preterm delivery or with low birth weight.

Maternal factors

Younger mothers (<25 years), lower educational achievement (below degree), and smoking during pregnancy were all univariably associated with high hygiene scores, whereas there was an inverse association with attendance at day care (table 2). Study mothers with a history of eczema were less likely to have children with a high hygiene score than non-atopic mothers; however, there was no association with maternal history of asthma. Paracetamol use in the last trimester of pregnancy was univariably associated with high hygiene score, although this was only significant for those who used paracetamol regularly (most days/every day). In the final model (between group analyses), all of these maternal factors with the exception of maternal age and maternal paracetamol use remained independently significant after adjustment (table 3). There was a dose response effect with maternal smoking in that as the reported number of cigarettes smoked during pregnancy increased, the odds ratio for a high hygiene score increased ($p < 0.0001$).

Social factors

There was an indication that women belonging to more socially disadvantaged groups were more likely to have children with high hygiene scores (table 2). For example,

women living in local authority housing or in overcrowded accommodation were more likely to have children with high hygiene scores compared with women living in mortgaged or owned property or with no overcrowding. High hygiene scores were more common for children whose mothers reported financial difficulties, though not significantly so in the adjusted model. In contrast, women living in homes with a damp problem were less likely to have children with high hygiene scores than those living in non-damp accommodation. On adjustment for other factors in the final model, living in local authority housing remained predictive of a high hygiene score, whereas living in damp housing was associated with a lower hygiene score (table 3).

Environmental factors

High hygiene scores were univariably associated with at least weekly contact with dogs ($p = 0.001$), other furry pets ($p = 0.01$), and other non-furry pets ($p = 0.003$), but not cats ($p = 0.3$). However, after adjustment in the final model (table 3), only contact with non-furry pets was significantly associated with high hygiene scores ($p_{adjusted} = 0.03$).

Those study mothers who made frequent use of chemical household products were more likely to have children with a high hygiene score, even after adjustment in the final model. The timing of the questionnaire was also an important independent predictor of a high hygiene score; a high hygiene score was more likely if the questionnaire was responded to in the summer months rather than in the winter months.

Weekend exposure to tobacco smoke was univariably associated with hygiene score. Those children who were always exposed to tobacco smoke at the weekend were more likely to have a high hygiene score than children who were never exposed to ETS at the weekend. Children with moderate exposure to ETS at the weekend were no more likely to have high hygiene scores than children unexposed. However, after adjustment for other social and maternal factors, particularly maternal smoking during pregnancy, the effect of continual exposure to ETS over the weekend was no longer statistically significant.

DISCUSSION

Contemporary data on cleanliness norms for young children living in the UK are scarce, despite the fact that modern day hygiene practices are believed by many to be responsible for the rising prevalence of diseases such as atopy and asthma.[2–5] The most recent review of infant hygiene in the UK was in 1978.[9] Furthermore, little is known about patterns of hygiene in the home and whether any social, environmental, or lifestyle factors influence the adoption of these practices.

Hygiene practices in the home cover many aspects including personal hygiene, food hygiene, and environmental and surface hygiene. Not only do we expose ourselves to an abundance of chemicals on a daily basis in the name of hygiene, there are also sociodemographic, environmental, and other lifestyle factors which may influence the adoption of certain hygiene practices in the home. These factors may mediate or even confound the reported associations between hygiene and atopic diseases, or indeed be themselves important in the aetiology of these diseases.

In this paper cleanliness norms for 15 month old children living in the UK have been presented and a number of social, maternal, and environmental factors associated with high levels of hygiene in infants, as measured by maternal report of infant washing and bathing frequency, have been identified.

From this study, it appears that hygiene practices in the home are, to an extent, influenced by social and lifestyle factors, such as maternal education level, housing tenure, and maternal smoking. Not surprisingly, increased frequency of use of chemical household products in the home was an independent predictor of a high hygiene score—mothers who more frequently washed their children were also making more frequent use of chemical household products. Interestingly, we found that women in lower educational groups, and/or living in local authority housing, and/or who smoked during pregnancy made more frequent use of these chemical products than their counterparts. Use of chemical household products may be a factor in the epidemiology of atopic diseases as well as respiratory diseases,[10] and may therefore explain why many studies have found the prevalence of such diseases higher in the more socially disadvantaged groups.[11 12]

The dose response effect for maternal cigarette smoking during the final trimester of pregnancy was striking, with increasing cigarette consumption independently associated with an increased odds ratio for a high infant hygiene score. This effect cannot be fully explained by increased use of chemical household products in smokers compared to non-smokers ($p = 0.002$, data not shown), and is independent of the fact that smoking is more common within the more socially disadvantaged groups. One study has suggested that certain groups of women over report what they deem to be desirable hygiene practices.[13] Smoking mothers who are aware that smoking is not a desirable social habit may be more likely to over report their hygiene practices as a result. This may artificially inflate any observed association between hygiene and ill health and thus should be accounted for in any future analyses. Because of the small numbers of children who were exposed to ETS but unexposed to tobacco smoke in utero, the effect of ETS could not be reliably disentangled from the effects of maternal smoking, although in the univariable analysis, constant exposure to ETS at the weekend was associated with increased infant hygiene.

Exposure to infection is higher for children attending day care, whether with a childminder or in a nursery, as a result of the increased interaction with their peers.[14–16] Our study revealed an inverse association between attendance at day care and high infant hygiene score, which could not be fully explained completely by the fact that mothers of children attending day care made less frequent use of chemical household products than mothers of children not in day care ($p < 0.0001$, data not shown). One study in the USA has suggested that contracting infectious diseases in day care is compounded by inadequate toilet and hand washing facilities, and staff with little or no training in infection control.[17] From our data, children attending day care have their faces and hands washed, and hands washed before meals less frequently than those not attending day care establishments—yet they are more likely to be given a daily bath or shower (data not shown). This suggests that hygiene practices do differ between day care establishments and the home. Hygiene practices in day care establishments may be based on routine or on a requirement basis; whereas we have shown that other social factors appear to influence the adoption of hygiene practices in the home. There are also strong social differences between mothers of children who attend day care and those who do not. For example, compared to mothers of children not attending day care, those whose children attended were more likely to have a degree (10.3% *v* 31%), to be non-smokers (80.7% *v* 88.7%), to breast feed their child for more than three months (41.6% *v* 58.2%), and to be older mothers (>25 years) (78.4% *v* 90.6%), and were less likely to live in local authority housing (14.0% *v* 2.9%). The day care variable may simply be reflecting these social differences, which we have shown to have an association with the adoption of certain hygiene practices.

The inverse association with high infant hygiene and damp housing does not follow the social pattern observed above. In the past, dampness in the home was associated with poor housing conditions, possibly more common in older local authority housing, but perhaps not so prevalent in more modern homes today. Those mothers reporting damp housing may not spend a great deal of time in their homes, therefore having

less opportunity to frequently wash their children and make use of chemical household products. Additionally, significantly more mothers in damp housing reported having financial difficulties when their child was 8 months of age than mothers living in non-damp accommodation. This group may represent quite a severely disadvantaged group whose hygiene practices are quite different to other groups and thus require further investigation.

There was a distinct seasonal effect on hygiene score in this study. Children whose questionnaires were completed in the winter months were less likely to have high hygiene scores than children whose questionnaires were completed in the summer months. This is probably a result of the fact that children take part in more outdoor play during the summer months and therefore require increased washing and bathing than they do in the winter months. The season should be considered in any analysis between hygiene and health, particularly atopy, which has a seasonal component to its incidence.

Mothers with a history of eczema were less likely to wash their children frequently than those with no history of eczema, a finding which could not be explained by other social or environmental factors. This finding may reflect the different hygiene practices of these mothers who may suspect that increased contact with water and soaps may exacerbate an already established skin condition in their child or actually provoke a reaction in an asymptomatic child. The fact that there was no difference in hygiene practices between mothers with a history of asthma/eczema and those without, suggests that it may have more to do with the symptoms of eczema rather than any other factor associated with the condition.

Conclusion

Important data on cleanliness norms for young children have been presented. Hygiene practices in the home appear not to be entirely requirement driven; rather their adoption is influenced to some degree by social, lifestyle, and environmental factors—with higher hygiene scores more prevalent in the more socially disadvantaged groups. Increased use of chemical household products in the more socially disadvantaged groups within ALSPAC has emerged as an important cofactor in any study of hygiene and ill health. In a follow up study, also published in this issue, all of the above factors have been considered in an investigation of the effects of high hygiene levels on the prevalence of wheezing and atopy in young children.[18]

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Complete versions of tables 2 and 3 can be viewed on the *ADC* website (www.archdischild.com)

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