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The epidemiology of head lice and scabies in the UK

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SUMMARY

Anecdotal evidence suggests that the prevalence of both scabies and head lice is increasing and also that both conditions are becoming refractory to pesticide treatment. Using information obtained from the Office of National Statistics, Royal College of General Practitioners Weekly Returns Service, Department of Health, local surveys of school children from Bristol and drug sales of insecticides, we have confirmed that there has been a rise in the prevalence of both conditions. We have shown that scabies is significantly more prevalent in urbanized areas ($P < 0{\cdot}00001$), north of the country ($P < 0{\cdot}000001$), in children and women ($P < 0{\cdot}000001$) and commoner in the winter compared to the summer. Scabies was also shown to have a cyclical rise in incidence roughly every 20 years. Head lice were shown to be significantly more prevalent in children and mothers ($P < 0{\cdot}000001$) though both conditions were seen in all age groups. Head lice were also less common during the summer. Host behaviour patterns, asymptomatic carriage, drug resistance and tourism from countries or districts with a higher incidence may be important factors in the currently high prevalence of both scabies and head lice.

INTRODUCTION

Sarcoptes scabiei is an ectoparasite of mammalian skin. Whilst not life threatening, scabies can be severe and persistent, leading to debilitation, depression and secondary skin infections. Affected individuals may be asymptomatic or present with a variety of skin eruptions, including papules, nodules, blisters and eczematous changes with superimposed excoriations and bacterial infections. The diagnosis is made by finding a typical scabies' burrow. Atypical appearances can be seen in the bedridden, immunosuppressed, children and the elderly. Incubation, number of mites carried and intensity of the itch are all variable. The natural duration of the condition may be indefinite. No study has shown the development of acquired immunity [1]. Scabies is not a notifiable disease. Anecdotal reporting in 1992–3 [2, 3] suggested an increased incidence of scabies based on an increase in the number of cases seen in dermatology outpatient clinics, and an increase in the number of local outbreaks reported to the Public Health Laboratory Service Communicable Disease Surveillance Centre. Similar anecdotal reporting from dermatology clinics in London, Leeds, Sheffield and Dublin indicated a high incidence of scabies based on hospital referral rates in 1947, a low incidence between 1951–7, and a high incidence between 1961–8 [4–8].

Head lice are insects and an obligatory ectoparasite of scalp hair. They can cause pruritus which may lead to secondary bacterial skin infection. Adult head lice usually number less than 10, although some host scalps may contain hundreds of lice. Since 1945, public health departments have mounted, without success, campaigns to eliminate head lice. The

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effectiveness of 'nit nurses' in controlling head lice within schools was never proven and they were deemed too costly to justify any impact they might have [9], so their role was abandoned in the early 1980s. The Department of Health now recommends regular combing and grooming of children by parents as the first line treatment for head lice because of the rising cost to health services of head lice insecticides and possible insecticide resistance [10, 11]. The media have highlighted the frustration of parents with school nurses, teachers, and family doctors over the problem of head lice, which is perceived to be worsening.

This paper examines the available historical and current data on head lice and scabies prevalence in the UK and possible reasons why this is changing.

METHODS

Data on the diagnoses of scabies or head lice in 60 GP practices throughout Great Britain were obtained from the Office of National Statistics (ONS). These data have been recorded every 10 years from 1971. Similar data for scabies were obtained from the Royal College of General Practitioners (RCGP) Birmingham Research Unit from their Weekly Returns Service collected from 91 participating GP practices between 1967 and 1996 [12]. Fifty-three of the RCGP practices were able to provide consultation data on head lice for 1994 and 1995.

School health returns documenting head lice infestations for England and Wales between 1957 and 1987 collected by school nurses for the Department of Health were also examined. No further collections were documented after 1987. Similar data, for both scabies and head lice, at a local level were gathered from Bristol district school health reports contained in the annual report of the Medical Officer for Bristol between 1945 and 1971. These figures were based on twice yearly vermin inspections of all Bristol schoolchildren.

Data concerning diagnoses of scabies made at all sexually transmitted diseases (STD) clinics in Great Britain from 1971–83 (when skin infestations were recorded as separate conditions) were also studied. Data on prescriptions for England for all topical insecticides for use on humans were obtained from 1980 to 1995 from the Department of Health; from 1980 to 1989 these figures were derived from a 1 in 200 sample of prescriptions, and from 1990 to 1995 on all prescriptions dispensed.

Scabies infestation rates within the RCGP study population were compared between urban and rural practices, northern and southern practices and between men and women for scabies and head lice using a test for two incidence rates, based on a normal approximation to the Poisson distribution [13].

RESULTS

Scabies

The diagnosis rate of scabies per quarter of the year per 100000 population for Great Britain, collected by the ONS, has altered from 370 cases in 1971 to 120 cases in 1981 and 340 cases by 1991. Figure 1 shows the RCGP incidence of scabies per 100000 population per month as a rolling 3-year average. For each year incidence in the winter and autumn was much higher than the incidence during the spring and summer months (not shown).

The distribution of affected cases during 1994 was assessed in more detail. Table 1 shows the age-specific diagnosis rate per quarter of the year for scabies and head lice. A much higher number of cases were recorded in the winter for the first three age groups than in the summer. The incidence rates in the 1994 study population were compared between rural and urban practices and there was a significantly higher incidence of scabies in urban areas ($P < 0{\cdot}00001$). Similarly, incidence rates were also compared between practices in the north and south (excluding practices in the central areas of the mainland) and there was a significantly higher incidence of scabies in the north ($P < 0{\cdot}00001$). A significantly higher incidence rate was seen in women ($P < 0{\cdot}000001$).

Figure 2 shows the estimated prevalence of scabies and head lice in schoolchildren between 1945–87 expressed as a percentage of the pupils examined each year. Data are shown from both national and regional sources. For scabies a sharp fall in the estimated prevalence of scabies over the first 5 post-war years can be seen. When the annual incidence of new cases of scabies per 100000 population diagnoses in sexually transmitted diseases (STD) clinics was assessed, a steady decline can be seen from 7·08 cases in 1971 to 4·68 cases in 1983.

Figure 3 shows NHS prescriptions for pesticides with a license for use against scabies. Based on product manufacturers sales figures, this accounts for approximately one-third of total drug sales for these items. It can be seen that there has been a fivefold increase in prescribing from 1980 onwards.

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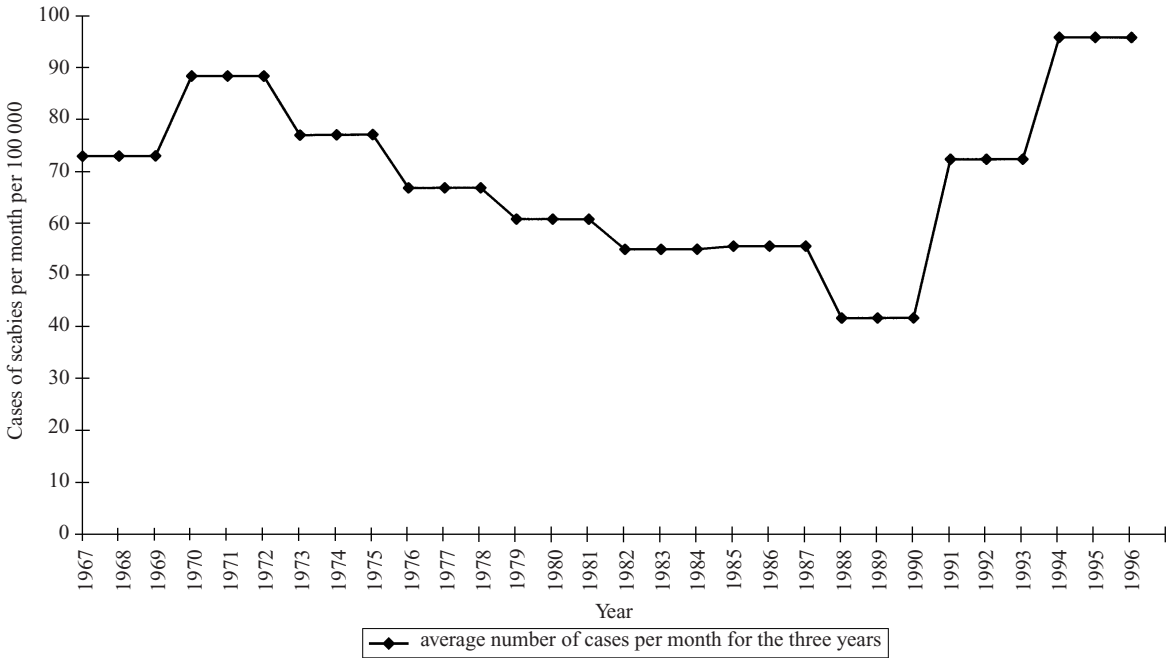

Fig. 1. The RCGP Weekly Returns Service for Great Britain (1967–96). Incidence of scabies per month per 100000 population as a rolling three year average.

Table 1. *Age-specific consultation rates per 100000 per year for 1994 for scabies and head lice from the RCGP Weekly Returns Service*

Years…	0–4	5–15	15–44	45–64	65+
Head lice	118·7	194	25·2	3·2	3·2
Scabies	52·9	60·5	34·3	12·2	9·5

Head lice

The ONS data show an incidence rate per quarter of the year per 100000 population of 40 cases in 1971 rising to 220 cases in 1981 and 270 cases in 1991. The RCGP data for 1994 (Table 1) show that head lice are not confined to schoolchildren but are present, at a lower incidence, in adults. A similar pattern was seen during 1995. A seasonal variation was seen in all age groups that was most obvious in children, with a lower incidence in the summer. A significantly higher incidence was seen in females ($P < 0{\cdot}000001$) within the RCGP study population for 1994 and 1995.

The estimated prevalence of head lice from school surveys (Fig. 2) was high during and soon after World War II and fell steeply to a low level by 1960. Prevalence remained low with a slight rise in the early 1970s followed by a fall in the mid 1970s. From then until 1987, a steady rise was recorded. NHS prescriptions for pesticides with a licence for use against head lice (Fig. 3) showed a 36-fold increase between 1980 and 1995.

DISCUSSION

Scabies

Data collected from the RCGP has previously been shown to reflect national morbidity trends for selected diseases where there are comparable national data [12]. Both the RCGP and ONS information show a high incidence of scabies in the late 1960s and early 1970s, a drop during the 1980s and a rise throughout the 1990s. This would appear to confirm the anecdotal reports in the literature. Danish statistics collected by all GPs in Denmark between 1990 and 1975 [14] found similar incidence rates between 1965 and 1975 to the RCGP data. The Danish study found two previous high incidence rates during World War I and World War II – the rise starting 2 years prior to hostilities breaking out in each case. The data collected from Bristol also confirm an apparent high prevalence of scabies during and soon after World War II. The recorded incidence from STD clinics between 1971 and 1983 concurs with the RCGP data in that there was a fall in the recorded incidence over this time period. All these surveys would appear to confirm the cyclical incidence of the condition. Herd immunity

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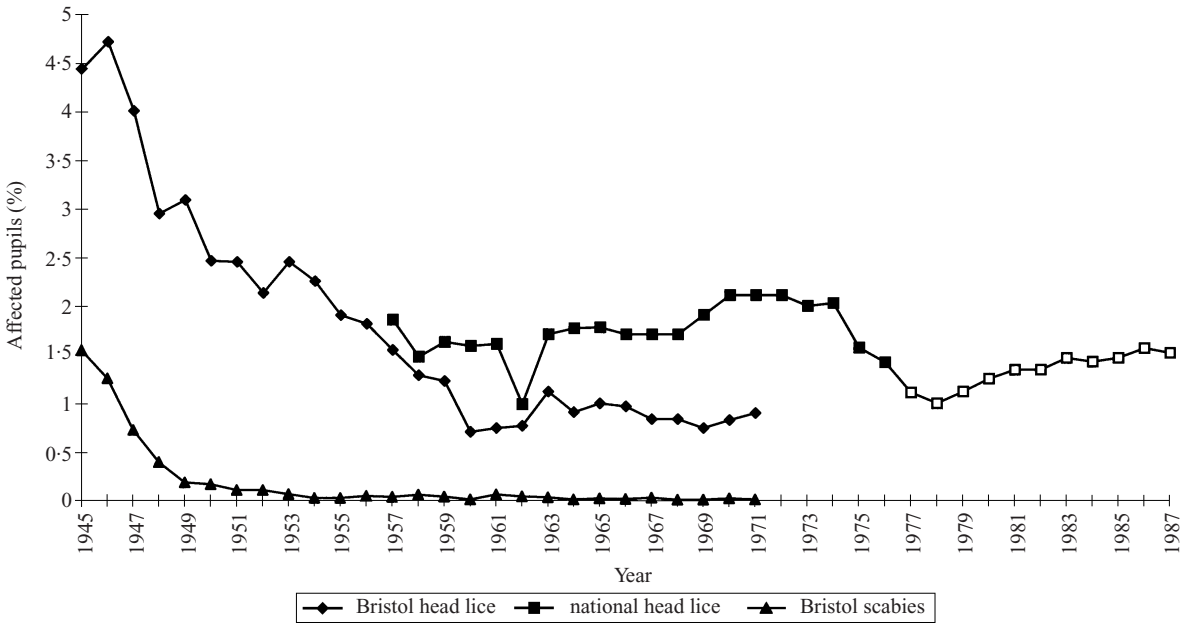

Fig. 2. School Health Returns to the Medical Officer for Bristol (1945–71) showing the prevalence of head lice and scabies and for England and Wales (1957–76) and England (1977–87) for head lice.

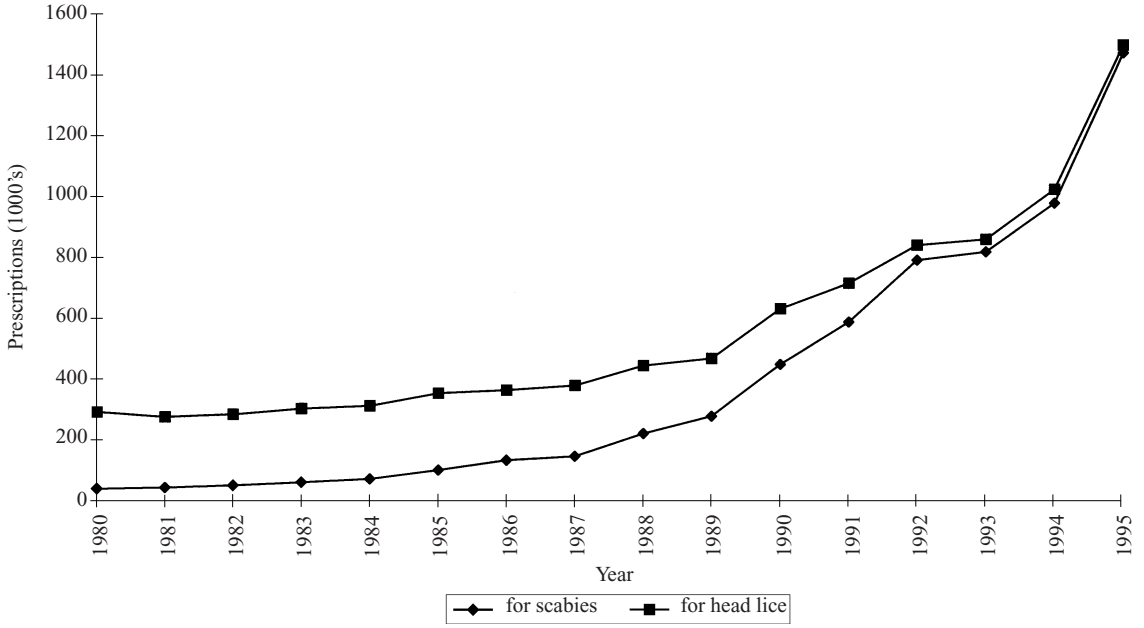

Fig. 3. Prescriptions dispensed in England of insecticides for use against scabies and head lice. Derived from samples of 1 in 200 prescriptions (1980–9) and all prescriptions (1990–5).

has been used to explain this [15]. However, acquired immunity has never been demonstrated, and second infestations with scabies do occur. There is no such cyclical pattern of incidence in tropical countries where the condition is endemic [16]. In the United States [17] the recorded post-war incidence of scabies did not rise until 1975 – several years after the higher incidence experienced in the UK. It could be that different countries are acting as population reservoirs of scabies, and as a result of tourism and population movements during civil unrest of war, scabies is becoming established in new communities.

Unlike the RCGP data, the Danish study [14] failed to find a difference between rural and urban areas. However data collected on scabies by the Israeli defence force between 1969 and 1987 did find a higher incidence in urban areas [18]. Overcrowding which facilitates infectious transmission is the probable cause

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for the difference seen. Both the RCGP and Danish studies have recorded a higher incidence in children and in females. This may be because of the natural behaviour of these population groups. In general, there is closer physical contact between children, women, child and mother or siblings than there is between adult men. These may create different transmission rates between groups of people and explain the variation in incidence by age and sex.

Danish, Israeli, Turkish and New Zealand studies [14, 18–20] as well as the RCGP study show a higher incidence in the winter compared to the summer. Cold weather may encourage overcrowding. Experimental work on *Sarcoptes scabiei* var. *canis* shows that all life-stages leave the burrow and wander on the skin and fall off. Females and nymphs are resistant to desiccation and can survive in a heated home environment up to 5 days and longer in a cool environment [21, 22]. Live mites are recoverable from human host's living environment [23]. Mellenby in 1943 showed that one volunteer out of 127 caught scabies from sleeping in a bed used the previous night by an infested case [1]. Medical and nursing staff who acquire scabies also prove that contact with an index case need not be prolonged [24–26]. Mite survival, its ease of transmission and a change in behaviour of the host to facilitate infectious transmission may explain the increased incidence during the cold months of the year and in overcrowded environments. It is possible that the difference in incidence between the north and south of the country, may be due to a temperature difference; the north being relatively cooler and therefore prolonging mite survival.

It is acknowledged that scabies is a difficult disease to diagnose. Mis-diagnosis will effect the data on recorded incidence. If there is a low prevalence of the condition, then the index of suspicion will be low and diagnoses will be missed. Children may present to GPs as the only symptomatic cases within a family. The whole family may have scabies, but all may not be treated. For surveillance purposes, only cases that have had a GP consultation will be recorded. This could easily inflate the childhood incidence relative to other age groups. The fact that all the data collected both nationally and internationally, show similar trends, supports the idea that although the true incidence of scabies is not known, the variations seen are a true reflection of scabies as it affects the population of the UK.

Acaricides are prescription-only medications. The only treatments that are not represented in the data collected, but are occasionally used to treat scabies, are sulphur ointments and 10% crotamiton cream but since these have other dermatological uses they were excluded. The rise in sales seen complements the RCGP and ONS information. The increase in incidence could be due to treatment failure. This may arise as a result of poor application of the treatment product, confined to symptomatic areas, or excluding sanctuary sites such as the genitalia, underneath the fingernails, or on the face and neck [27, 28]. Reinfection from asymptomatic carriers or the local environment may also produce treatment failures. Other acari, such as the rust mite and various spider mites, have shown resistance to similar pesticides used to treat scabies [29]. True pesticide resistance is difficult to prove. Anecdotal evidence has questioned the efficacy of lindane, but not that of organophosphates or synthetic pyrethroids [30, 31]. The decline of scabies in the 1970s does coincide with the introduction of organophosphates for scabies treatment. Permethrin was introduced in 1992, and would appear to have made little impact on the rising incidence.

Head lice

All the data sources used in this study include body and crab (pubic) lice as well as head lice under the generic term 'lice'. The incidence of patients with crab lice presenting to STD clinics has risen, in absolute terms, from 7 new cases per 100000 to 20 new cases per 100000 between 1971 and 1987 [33, 34]. Assuming that an equal number of these cases present to general practitioners rather than STD clinics, it would still only form a small fraction of the ONS or RCGP rates, and it would not account for the large rise in sales of medicines.

The ONS data confirm a rise in head lice incidence in a general practice setting. Instead of a true rise in incidence these data could also reflect the diminishing role of school nurses, with the GP as the only avenue for parents to obtain free prescriptions for treatment for their children. The actual values may be an underestimate (especially in adults), since the surveillance only records those members of a family who have consulted. Where the number of insects carried on the scalp is low, diagnosis can be easily missed. Parents and grandparents may not consider themselves susceptible to infestation. Since most infestations are asymptomatic, then they may well form a substantial silent reservoir for reinfecting school-

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children [35]. The seasonal variation seen in children may reflect less physical contact and overcrowding during the summer. Temperature is not a factor, as the condition is present in all parts of the world [36]. Girls, and mother and child often have a closer physical contact, which may facilitate transmission and explain why these groups have a higher incidence relative to males. Other head lice surveys have confirmed an association with female sex, overcrowding and other affected family members [37–40].

School nurse inspections of schools in Great Britain differed in the percentage of pupils that were examined each year. An average school would have between 1 and 2 inspections per year. Schools nurses used different diagnostic criteria. Some took the presence of empty egg shells (nits) as evidence of an active infestation, whilst others required the visual identification of a louse. Changes in nursing practice could have had a profound effect on the recorded occurrence. A prevalence study in France [41] based on a sample of 4000 pupils noted a wide variation in prevalence over a year. This may mean that the timing of an inspection is important to obtain consistent data. Parents may also treat their children prior to a school inspection if they have been notified about the inspection in advance. One local authority in 1972 observed an 80% decrease in head lice incidence following a local press and pamphlet advertising campaign [42]. Information campaigns with the added threat of compulsory cleansing under Section 54 of the 1944 Education Act had a similar effect on prevalence in Teeside in 1971 [43]. Changes in classroom teaching styles undertaken in the 1970s resulted in primary schoolchildren sitting in small groups around tables, rather than at single-pupil desks. This facilitates head-to-head contact and may allow head lice to spread rapidly.

The introduction in 1948 of lindane and DDT coincided with a decline in the prevalence of head lice that we have been able to demonstrate. During the 1960s, increasing concentrations of lindane were marketed due to apparent product resistance. In 1971, malathion, an organophosphate, was launched which heralded another decrease in the measurable prevalence of head lice a few years later. Synthetic pyrethroids were launched in 1992. Sales of all chemicals have risen sharply since then which coincides with the anecdotal reporting of a current head lice problem. Drug resistance may well be playing a part in this rise. Head lice resistance to malathion and synthetic pyrethroids has been confirmed both clinically and experimentally in UK and France [10, 44].

Any long-term impact on the incidence of head lice or scabies will first require a standard approach for surveillance of the two conditions to plot the true incidence and prevalence, by either examining the most affected population group – schoolchildren in the case of head lice, or through the participating GP practices in the Weekly Returns Service. A change from group learning in classrooms to the more traditional format where children are separated during lessons, may reduce the rate of transmission of head lice. An awareness of how and why treatments may fail and the recognition that some pesticides may be ineffective in some cases is also important if we are going to reduce the prevalence of both conditions.

REFERENCES

1. Mellenby K. Transmission of scabies. Med Officer 1941; **67**: 190–1.
2. Cohen BJ, Hall SM, Healing TD, et al. Quarterly communicable disease review January to March 1993. J Pub Health Med 1993; **15**: 281–8.
3. Barrett NJ, Morse DL. The resurgence of scabies. CDR 1993; **3**: R32–R33.
4. Shrank AB, Alexander SL. Scabies: another epidemic? BMJ 1967; **285**: 669–71.
5. Hellier FF. Incidence of scabies. Arch Dermatol 1966; **93**: 634.
6. Danby PR, Church RE, Sneddon IB. Eradicating scabies. BJM 1967; **285**: 496–7.
7. Meenan FO. The scabies epidemic. BMJ 1967; **285**: 507.
8. Alexander JO'D. The scabies epidemic. BMJ 1967; **285**: 766.
9. Owen CM. Too much nit-picking? Nursing Times 1982; **4**: 632–4.
10. Downs AMR, Stafford KA, Coles GC. Head lice are resistent to insecticides. BJ Dermatol 1998; **138**: 742.
11. Burgess I, Brown CM, Peock S, Kaufman J. Head lice resistant to pyrethroid insecticides in Britain. BMJ 1995; **311**: 752.
12. Fleming DM, Fullerton J. The application of a general practise database to pharmacoepidemiology. Birmingham Morbidity & Prescribing Information Project. Occas Pap R Coll Gen Pract 1993; **62**: 1–21.
13. Kirkwood BR. Essentials of medical statistics. Oxford: Blackwell Scientific, 1988.
14. Christophersen J. The epidemiology of scabies in Denmark, 1900–1975. Arch Dermatol 1978; **114**: 747–50.
15. Green MS. Epidemiology of scabies. Epidemiol Rev 1989; **11**: 126–49.
16. Orkin M. Resurgence of scabies. JAMA 1971; **217**: 593–7.

https://doi.org/10.1017/S0950268899002277 Published online by Cambridge University Press

17. Shaw PK, Juranek DD. Recent trends in scabies in the United States. J Infect Dis 1976; **134**: 414–6.
18. Kimchi N, Manfred SG, Stone D. Epidemiological characteristics of scabies in the Israel defense force. Int J Dermatol 1989; **28**: 180–2.
19. Andrews JRH. Scabies in New Zealand. Int J Derm 1979; **7**: 545–52.
20. Tuzun Y, Kotogyan A, Cenesizoglu E, et al. The epidemiology of scabies in Turkey. Int J Derm 1980; 19: 41–4.
21. Arlain LG, Vyszenski-Moher DL. Life cycle of *Sarcoptes scabiei* var. *canis*. J Parasit 1989; **74**: 427–30.
22. Arlain LG, Vyszenski-Moher DL, Pole MJ. Survival of adults and developmental stages of *Sarcoptes scabiei* var. *canis* when off the host. Exp Appl Acarol 1988; **6**: 181–7.
23. Arlain LG, Vyszenski-Moher DL. Prevalence of *Sarcoptes scabiei* in the homes of scabetic patients. J Am Acad Derm 1988; **19**: 806–11.
24. Marshall R, Barkess-Jones L, Sivayoham S. An outbreak of scabies in a school for children with learning disabilities. CDR 1995; **5**: R90–2.
25. Parish LC. Scabies again. Int J Derm 1975; **14**: 115–6.
26. Burns DA. An outbreak of scabies in a residential home. B J Dermatol 1987; **117**: 359–61.
27. Helle W. Resistance in the Acarina: Mites. Adv Acarol 1965; **2**: 71–93.
28. Scher RK. Subungual scabies. Am J Dermatopath 1983; **5**: 187–9.
29. Taplin D, Meinking BA, Chen JA, Sanchez R. Comparison of crotamiton 10% cream and permethrin 5% cream for the treatment of scabies in children. Ped Derm 1990; **7**: 67–73.
30. Roth WI. Scabies resistant to Lindane 1% lotion and crotamiton 10% cream. J Am Acad Derm 1991; **24**: 502–3.
31. Leibowitz MR. Failure of scabies treatment. NZ Med J 1993; **150**: 317–8.
32. Fraser J. Permethrin: a top end viewpoint and experience. Med J Aust 1994; **160**: 806.
33. Anon. Sexually transmitted diseases. Br J Vener Dis 1983; **59**: 134–7.
34. STDs in England and Wales, 1978–1987. CDR 1991; 1.
35. Maunder JW. Updated community approach to head lice. J Roy Soc Hlth 1988; **6**: 201–3.
36. Chunge RN, Scott FE, Underwood JE, Zavarella KJ. A review of the epidemiology, public health importance, treatment and control of head lice. Can J Pub Hlth 1991; **82**: 196–200.
37. Ebomoyi E. Pediculosis capitis among primary school children in urban and rural areas of Kwara state, Nigeria. J Sch Hlth 1988; **6**: 201–3.
38. Slonka GF, McKinley TW, McCroan JE, et al. Epidemiology of an outbreak of head lice in Georgia. Am J Trop Med Hyg 1976; **25**: 739–43.
39. Sarvo B, Neuman L, Herman Y, Naggan L. Evaluation of an intervention program for head lice infestation in school children. Ped Inf Dis J 1988; **7**: 176–9.
40. Hoffman G. Epidemiology and control of pediculosis capitis infestations in the Federal Republic of Germany. J Roy Soc Hlth. 1983; **3**: 88–92.
41. Combescot C. Epidemiologie actuelle de la pediculose a *Pediculus capitis*. Bull Acad Natle Med 1990; **2**: 231–7.
42. Report of the Chief Medical Officer for 1971–1972 London: HMSO, 1972.
43. Donaldson RJ. The head louse in England: prevalence amongst schoolchildren. The Health Education Council London: HMSO, 1975.
44. Choidow O, Chastang C, Brue C, et al. Controlled study of malathion and d-phenothrin lotions for *Pediculus humanus* var. *capitis*-infested schoolchildren. Lancet 1994; **344**: 1724–7.

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